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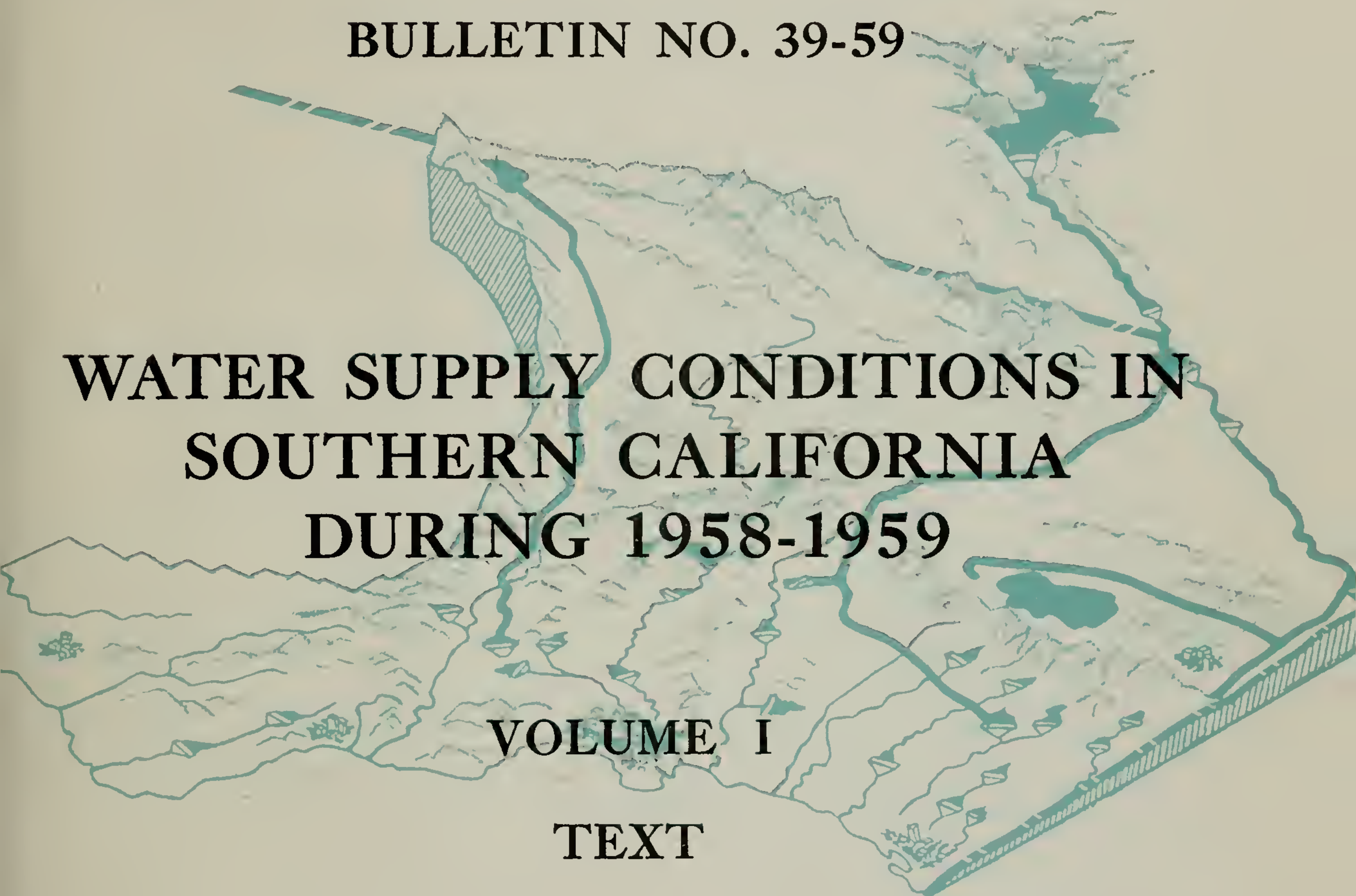
STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

BULLETIN NO. 39-59



WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-1959

VOLUME I

TEXT

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EDMUND G. BROWN
Governor

WILLIAM E. WARNE
Director of Water Resources

MAY, 1961

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

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VOLUMES OF BULLETIN NO. 39-59

Volume I—Text.

Volume II—Water Level Data, Central Coastal, and Los Angeles Regions.

Volume III—Water Level Data, Lahontan, Colorado River Basin, Santa Ana, and San Diego Regions.

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(The following appendixes are bound in Volume II)

(The following appendixes are bound in Volume III)

.IAM E. WARNE
DIRECTOR

EDMUND G. BROWN
GOVERNOR

ADDRESS REPLY TO
P. O. BOX 388 SACRAMENTO 2
1120 N STREET HICKORY 5-4711

STATE OF CALIFORNIA
Department of Water Resources
SACRAMENTO

May 31, 1961

Honorable Edmund G. Brown, Governor
Members of the Legislature of the
State of California

Gentlemen:

I have the honor to transmit herewith Bulletin No. 39-59, entitled "Water Supply Conditions in Southern California during 1958-1959". This report is the latest of the series of annual reports on water supply conditions in Southern California, prepared pursuant to Sections 225 and 226 of the California Water Code.

During the water year 1958-59 (October 1, 1958 through September 30, 1959) precipitation was generally below normal throughout Southern California. As a result, there was a continuation of the drought which has prevailed in Southern California since 1944 and which has been interrupted only by the above normal years of 1951-52 and 1957-58. Precipitation in coastal Southern California averaged approximately 50 percent of the mean, and the runoff of streams in this area amounted to about 40 percent of the mean.

The amount of water stored in those surface reservoirs which store only local runoff amounted to 23 percent of capacity on October 1, 1959. This was somewhat less than that recorded at the end of the previous year. Storage in Lake Mead on the Colorado River decreased, during the 1958-59 water year, from 86 to 74 percent of usable capacity. In general, ground water levels declined although, to some degree, this decline was retarded in a number of basins by artificial recharge activities. The intrusion of sea water continued in several important coastal ground water basins, particularly in the Oxnard Plain pressure area of Ventura County, West Coast Basin in Los Angeles County, and the East Coastal Plain pressure area in Orange County.

Importations of water to coastal Southern California through aqueducts of the City of Los Angeles, and The Metropolitan Water District of Southern California, totaled about 991,000 acre-feet of water, which partially offset the deficiency of local water supplies. The amount imported was about 21 percent more than that imported during the previous year.

Sincerely yours,

William E. Warne

Director

ACKNOWLEDGMENT

Contributions were made and assistance rendered by many public and private agencies and individuals in the preparation of this report.

Special mention is made of the cooperation received from the following:

City of San Bernardino

City of San Diego

Los Angeles County Flood Control District

Los Angeles Department of Water and Power

Orange County Flood Control District

Riverside County Flood Control and Water Conservation District

San Bernardino County Flood Control District

The Metropolitan Water District of Southern California

United States Geological Survey

United States Weather Bureau

United Water Conservation District

Ventura County Flood Control District

State of California, Office of Controller, Division of Disbursements

Eleventh Naval District, Public Works Office

The Department of Water Resources gratefully acknowledges the assistance of these agencies without which preparation of the report would have been much more difficult and time consuming.

ORGANIZATION

STATE DEPARTMENT OF WATER RESOURCES

William E. Warne . . . . Director of Water Resources
James F. Wright . . . . Chief Deputy Director of Water Resources

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CHAPTER I. INTRODUCTION

This report is the twenty-eighth of the Bulletin No. 39 series which has been published annually since 1932. The report contains a discussion of water supply conditions in the Southern California area for the 1958-59 season together with supporting basic data for that season compiled by the Department of Water Resources and numerous other water agencies operating within the area. Data are presented concerning precipitation, surface stream flow, and underground waters, including consideration of both quantity and quality of these resources. Information is also included about activities of numerous operating water agencies. This material is intended for the use of water agencies and the public in the study and management of surface and underground water supply operations.

The protracted drought plaguing Southern California since the beginning of the 1944-45 season has extended through another year. The recorded rainfall for the City of Los Angeles was the lowest in history. This series of subnormal years has been interrupted only by the wet seasons of 1951-52 and 1957-58. Seasonal unimpaired runoff was considerably below normal and storage in most surface reservoirs was not only decidedly lower than that of a year ago, but approached an all-time low. In many areas ground water levels declined, although this was mitigated to a considerable extent by the lingering effects of late season runoff from the 1957-58 year. In some of the more heavily pumped basins, overdraft conditions prevailed, and in certain coastal basins, water levels were below sea level and conditions favorable to the intrusion of sea water continued.

The amount of supplemental water imported to coastal Southern California was increased 14 percent to 991,000 acre-feet in an endeavor to compensate for the shortage of local supply. These waters were imported from the Owens River and Mono Basin by the City of Los Angeles and from the Colorado River by The Metropolitan Water District of Southern California.

Authorization

The California Legislature of 1929 enacted legislation designated Chapter 832, Statutes of 1929, quoted in part, as follows:

> "SECTION 1. Out of any money in the state treasury not otherwise appropriated, the sum of four hundred fifty thousand dollars*, or so much thereof as may be necessary, is hereby appropriated to be expended by the state department of public works in accordance with law in conducting work of exploration, investigation and preliminary plans in furtherance of a coordinated plan for the conservation, development and utilization of the water resources of California including the Santa Ana river and its tributaries, the Mojave river and its tributaries, and all other water resources of southern California."
>
> * Reduced by the Governor to $390,000.

Pursuant to this legislation the Division of Water Resources undertook a series of hydrologic investigations of the Southern California area. Funds have been provided for the Division of Water Resources and the Department of Water Resources to continue these studies by subsequent sessions of the legislature. Initially, this included some investigation of the quality of irrigation waters; however, pursuant to Chapter 1552, Statutes of 1949, this work was expanded to include the study of pollution and degradation of waters of the State.

Prior Reports

Bulletin No. 39, entitled "Records of Ground Water Levels at Wells", was published in 1932 as a part of the investigations initiated by Chapter 832. Since then, water levels at selected wells have been published annually in Bulletins Nos. 39-A through 39-W, and Bulletins Nos.

39-56 through 39-58. Bulletin No. 39-56, the first of the numbered series, followed Bulletin No. 39-W without interruption in the continuity of data.

Since 1930, many bulletins covering various aspects of the hydrology of the South Coast Basin have been published by the Department of Water Resources and its predecessor, the Division of Water Resources. These bulletins include data on water use, ground water levels, quality of water, value and cost of water for irrigation, water losses and evaporation data, underground geology, and evaluation of overdraft on ground water basins in Southern California. These bulletins include:

California State Department of Public Works, Division of Water Resources. "Santa Ana River Basin". Bulletin No. 31. 1930.

California State Department of Public Works, Division of Water Resources. "South Coastal Basin, A Symposium". Bulletin No. 32. 1930.

California State Department of Public Works, Division of Water Resources. "Rainfall Penetration and Consumptive Use of Water in Santa Ana River Valley and Coastal Plain". Bulletin No. 33. 1930.

California State Department of Public Works, Division of Water Resources. "South Coastal Basin Investigation, Quality of Irrigation Waters". Bulletin No. 40. 1933.

California State Department of Public Works, Division of Water Resources. "South Coastal Basin Investigation, Detailed Analyses Showing Quality of Irrigation Waters". Bulletin No. 40-A. 1933.

California State Department of Public Works, Division of Water Resources. "South Coastal Basin Investigation, Value and Cost of Water for Irrigation in Coastal Plain of Southern California". Bulletin No. 43. 1933.

California State Department of Public Works, Division of Water Resources. "South Coastal Basin Investigation, Water Losses Under Natural Conditions from Wet Areas in Southern California". Bulletin No. 44. 1933.

California State Department of Public Works, Division of Water Resources. "South Coastal Basin Investigation, Geology and Ground Water Storage Capacity of Valley Fill". Bulletin No. 45. 1934.

California State Department of Public Works, Division of Water Resources. "South Coastal Basin Investigation, Overdraft on Ground Water Basins". Bulletin No. 53. 1947.

California State Department of Public Works, Division of Water Resources. "Report to the Assembly of the State Legislature on Water Supply of Antelope Valley in Los Angeles and Kern Counties". May, 1947.

California State Department of Public Works, Division of Water Resources. "Southern California Area Investigation, Memorandum Report on Water Conditions in Antelope Valley in Kern, Los Angeles and San Bernardino Counties". February 1955.

California State Water Resources Board. "Los Angeles County Land and Water Use Survey, 1955". Bulletin No. 24, June 1956.

California State Department of Water Resources. "Quality of Surface and Ground Waters in Upper Santa Ana Valley". Bulletin No. 40-57. June, 1957.

California State Department of Water Resources, Division of Resources Planning. "Sea-Water Intrusion in California". Bulletin No. 63. August 1958.

California State Department of Water Resources, "Orange County Land and Water Use Survey, 1957". Bulletin No. 70, January 1959.

California State Department of Water Resources. "Upper Santa Ana River Drainage Area Land and Water Use Survey, 1957". Bulletin No. 71, June 1960.

Contemporary Basic Data Reports

This report is one of several reports issued annually by the Department of Water Resources designed primarily to publish basic hydrologic data and to present discussions of water supply conditions. These reports are listed below. The year indicated in the title is that of the latest publication prior to December 1960.

Bulletin Series No.	Name
23	Surface Water Flow for 1957 (Formerly Sacramento-San Joaquin Water Supervision)
39	Water Supply Conditions in Southern California during 1957-58

Bulletin Series No.	Name
65	Quality of Surface Waters in California, 1955-1956
66	Quality of Ground Waters in California, 1956-1957
77	Ground Water Conditions in Central and Northern California, 1957-58

In addition, Water Conditions Reports are prepared as of the first of each month from February through May of each year. They contain forecasts of the runoff that is expected to occur during the ensuing April-July snow-melt period. The April 1 reports contain a section on ground water conditions and a tabulation of ground water-level data.

Scope of Activity and Report

The early reports of the Bulletin No. 39 series were limited to publication of records of ground water levels in the Santa Ana, San Gabriel, and Los Angeles River Valleys, and the West and South Coastal Plains. Subsequently, the area covered by the report was extended to include the San Jacinto and Antelope Valleys. A general water supply summary for the southern portion of the State was added in 1948. The summary contained information on precipitation, runoff, surface reservoir storage, importations, water quality, and changes in ground water levels.

To enable more rapid dissemination of data, the period encompassed by the reports was changed in 1956 from the calendar to the water year, or precipitation year as the data permitted, and the area was expanded to include the entire Southern California District (see Plate 1). In addition, discussions of sea-water intrusion, weather modification operations, outflow to the ocean, and sewage discharge to the ocean were included to provide a more complete description of water supply conditions.

Bulletin 39-59 is presented in three volumes. This first volume contains a description of the water supply conditions during the 1958-59 season, while Volumes II and III consist of a number of appendixes containing water level data. The discussion of water supply conditions is presented in this volume in four succeeding chapters as follows:

Chapter II	Surface Water Supply
Chapter III	Ground Water Supply Conditions
Chapter IV	Quality of Water and Sea-Water Intrusion
Chapter V	Construction Activities Affecting Water Supply Conditions

Also attached to Volume I are sixteen plates.

Volume II contains Appendix A, "Records of Ground Water Levels at Wells in Central Coastal Region (No. 3)", and Appendix B, "Records of Ground Water Levels at Wells in Los Angeles Region (No. 4)". Volume III contains Appendix C, "Records of Ground Water Levels at Wells in Lahontan Region (No. 6)", Appendix D, "Records of Ground Water Levels at Wells in Colorado River Basin Region (No. 7)", Appendix E, "Records of Ground Water Levels at Wells in Santa Ana Region (No. 8)", and Appendix F, "Records of Ground Water Levels at Wells in San Diego Region (No. 9)".

Definition of Seasons

Reference is made to a number of periods or seasons in the description of water supply conditions presented in the ensuing chapters of this report. The time period involved depends upon the type of data being described, as follows:

Precipitation

Precipitation data covers the 12-month period July 1 through June 30. This conforms to standard United States Weather Bureau practice.

Surface Runoff

Surface runoff data are compiled for the water year, which comprises the 12-month period, October 1 through September 30. Artificial recharge, import of water, and sewage discharge data are also related to this period.

Reservoir Storage

The quantity of water in storage in surface reservoirs is given as of October 1 of each year.

Ground Water Levels

The appendixes to this report contain water level data for the period July 1, 1958, through June 30, 1959. However, for purposes of the discussion of water supply conditions, ground water level data are generally related to the period spring to spring. This generally approximates the period April 1958 to March 1959. This period is used since about one-half of the wells are measured on a semiannual basis in the spring and in the fall, because the most uniform coverage can be obtained only at these times. All ground water data collected by local agencies were obtained during the summer when additional assistance was available. The spring period was selected in an endeavor to make this report as current as possible. In a few instances, particularly when only annual measurements are collected, some other period corresponding to the field measurements is referred to. Where such deviations are made, appropriate notes are provided.

Methods and Procedures

The use of machine data handling procedures facilitated preparation of the appendixes to this report. Water level data were placed on IBM cards and listed by use of a tabulating machine. It was necessary to adopt a coding or numbering system to designate ground water basins, precipitation stations, and wells, in connection with this procedure. These systems are described in the following paragraphs.

Areal Designation Code

The areal designation code is based on a decimal numbering system using the form x-xx.xx, although in appendixes, machine limitations have required the shortening of this to the form xxxxx. The number to the left of the dash refers to the geographic region as defined in Section 13040 of the State Water Code. The two digits to the left of the decimal point refer to a hydrologic unit. This unit generally comprises a major watershed, which may include areas overlying both water-bearing and nonwater-bearing formations. For simplification, the designation "hydrologic unit" is also given to groups of small adjacent watershed areas, with similar hydrologic conditions, which drain directly to the ocean. An example of the latter is the Malibu Hydrologic Unit. The two digits to the right of the decimal point refer to a subunit within the hydrologic unit, including, as before, areas overlying both water-bearing and nonwater-bearing formations. The locations and numerical codings for the hydrologic units and subunits within the area treated in this report are shown on Plates 6 through 11.

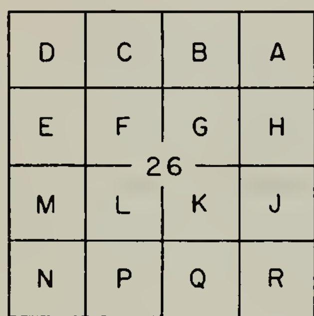
Precipitation Station Designation

Precipitation stations are designated by their longitude and latitude to the nearest second. This gives the location of the station within an accuracy range of about 100 feet.

Well Numbering System

The well numbering system employed herein is that originated by the United States Geological Survey and is referenced to the township, range and section subdivision of the Federal Land Survey. It conforms to that used in all ground water investigations made by the U. S. Geological Survey in California and has been adopted by the Department of Water Resources. A cross-index between this numbering system and systems in common use by other agencies in the Southern California area was published as Volume IV of Bulletin 39-57.

Under the adopted system each section is divided into 40-acre plots, called lots, which are lettered as follows:



Wells are numbered within each of these lots according to the sequence in which they have been assigned State Well Numbers. For example, a well which has the number 10N/18E-26A1, S would be in Township 10 North, Range 18 East, Section 26, San Bernardino Base and Meridian, and would be further located as the first well assigned a State Well Number in Lot A. In this report, well numbers are referenced either to the San Bernardino Base and Meridian (S) or the Mount Diablo Base and Meridian (M).

For some wells, the letter following the section number is designated "X". This indicates that the well has been field located and accurately plotted with respect to its position on the map, but that the map control for the Public Land Survey at present is too poor to warrant assignment of a more accurate location number.

CHAPTER II. SURFACE WATER SUPPLY CONDITIONS

The 1958-59 season was one of the driest in the history of Southern California, particularly in coastal areas, and was the thirteenth year of subnormal rainfall since the start of the current drought in 1944. This protracted drought has been interrupted only by the wet years of 1951-52 and 1957-58. The following pages discuss the manifestation of this subnormal season in terms of precipitation, runoff, storage in surface reservoirs, imports, runoff to the ocean, and sewage discharges to the ocean.

Precipitation

During the summer months of 1958 precipitation in Southern California was generally above normal, primarily as the result of thundershowers. Normal, as used here, relates to the average for the 50-year period 1897-1947. However, this above-normal condition was short-lived. The November and December period was one of the driest of record, for no precipitation was recorded at Los Angeles, and by January 1, 1959, the seasonal total at this station was only 20 percent of normal. This condition prevailed throughout the balance of the season, with the exception of the month of February which was about normal for the major portion of Southern California. The fluctuation of rainfall as the 1958-59 season advanced is indicated by the data shown in Table 1, which presents cumulative monthly precipitation for the 1958-59 season and for the 50-year period 1897-1947 for stations at Santa Maria, Los Angeles, San Diego, and Barstow.

In coastal Southern California the total seasonal precipitation during the 1958-59 season was only about one-half of the 50-year normal. In the desert areas the precipitation varied over a wide range from about 15 percent of the mean at Brawley, to 130 percent of the mean at Barstow.

The total seasonal rainfall in inches and in percent of mean is presented in Table 2 for selected stations representing a variety of areas in Southern California. The general distribution of precipitation, indicated by lines of equal precipitation index, may be seen from an inspection of Plate No. 2, "Precipitation during 1958-59 in Percent of 50-Year Mean".

TABLE 1

CUMULATIVE MONTHLY PRECIPITATION
AT SANTA MARIA, LOS ANGELES,
SAN DIEGO AND BARSTOW

Month	Cumulative monthly precipitation at Santa Maria			Cumulative monthly precipitation at Los Angeles			Cumulative monthly precipitation at San Diego			Cumulative monthly precipitation at Barstow		
		1958-59 season			1958-59 season			1958-59 season			1958-59 season	
	50-year mean, 1897-1947, in inches	In inches	In percent of mean	50-year mean, 1897-1947, in inches	In inches	In percent of mean	50-year mean, 1897-1947, in inches	In inches	In percent of mean	50-year mean, 1897-1947, in inches	In inches	In percent of mean
July	0.01	Trace	0	0.01	Trace	0	0.03	Trace	0	0.15	1.90	1266
August	0.06	Trace	0	0.03	0.39	1300	0.09	Trace	0	0.41	2.13	519
September	0.28	1.57	561	0.31	0.46	148	0.23	0.62	270	0.58	2.95	509
October	0.90	1.57	174	0.90	0.52	58	0.79	0.63	80	0.87	3.88	446
November	1.91	1.81	95	1.96	0.52	26	1.61	1.07	66	1.16	4.41	380
December	4.08	1.97	48	4.46	0.52	12	3.59	1.13	31	1.75	4.41	252
January	7.09	3.99	56	7.41	1.76	24	5.51	1.21	22	2.41	4.72	196
February	9.72	8.36	86	10.78	5.08	47	7.67	4.97	65	3.04	5.46	180
March	12.15	8.36	69	13.45	5.08	38	9.32	4.97	53	3.72	5.48	147
April	13.05	8.62	66	14.40	5.58	39	10.05	5.28	52	3.98	5.48	138
May	13.43	8.62	64	14.74	5.58	38	10.32	5.28	51	4.08	5.48	134
June	13.52	8.62	64	14.81	5.58	38	10.36	5.28	51	4.17	5.48	131

TABLE 2

SEASONAL AND MEAN PRECIPITATION AT
SELECTED STATIONS IN SOUTHERN CALIFORNIA

Station	County	50-year mean: 1897-1947, in inches	1958-59 season: In inches	1958-59 season: In percent of mean
San Luis Obispo	San Luis Obispo	21.68	11.76	54
Paso Robles	San Luis Obispo	15.82	8.93	56
Santa Maria	Santa Barbara	13.52	8.62	64
Santa Barbara	Santa Barbara	18.56	9.06	49
Ventura	Ventura	15.59	6.74	43
Los Angeles	Los Angeles	14.81	5.58	38
Pomona	Los Angeles	18.21	8.18	45
Santa Ana	Orange	14.16	6.41	45
San Bernardino	San Bernardino	17.21	6.15	36
Bishop	Inyo	6.14	3.95	64
Barstow	San Bernardino	4.17	5.48	131
Blythe	Riverside	4.03	2.93	73
Brawley	Imperial	2.40	0.36	15
Oceanside	San Diego	12.38	4.27	34
San Diego	San Diego	10.36	5.28	51

An illustration of the historical fluctuation in the water supply from rainfall is depicted on Plate 3, which shows the historical, seasonal precipitation and accumulated deviation from the 50-year mean at stations located in Santa Maria, Los Angeles, San Diego and Barstow.

More detailed information concerning precipitation in each of the regions in the Southern California District, and information on weather modification operations is given in the following paragraphs.

Central Coastal Region (No. 3)
Santa Barbara and San Luis Obispo Counties

Precipitation in those hydrologic units in San Luis Obispo and Santa Barbara Counties, shown by data presented in Table 3, varied from a maximum average of 80 percent of the mean for the 50-year period 1897-1947

TABLE 3

AVERAGES OF INDEXES OF PRECIPITATION FOR STATIONS IN HYDROLOGIC UNITS IN CENTRAL COASTAL REGION (NO. 3) FOR THE 1958-59 SEASON

Hydrologic unit	Areal designation code	Number of stations	Average index
Salinas Valley	3- 4.00	6	52
San Luis Obispo Group	3- 8.00	1	54
Arroyo Grande Group	3-11.00	1	55
Santa Maria River Valley	3-12.00	5	59
Cuyama River Valley	3-13.00	2	80
San Antonio Creek Valley	3-14.00	2	59
Santa Ynez River Valley	3-15.00	7	70
South Coast Basins, Santa Barbara County	3-16.00	3	60
Carrizo Plain	3-19.00	3	75
Cambria Group	3-21.00	1	66
Santa Barbara County Coastal Group	3-22.00	1	38
Southern Central Coastal Region		32	62

for stations in the Cuyama River Valley, to a minimum of 38 percent in the Santa Barbara County Coastal Group. The average of precipitation indexes for all stations in these counties was 62 percent of the mean. Measured seasonal precipitation at the City of San Luis Obispo was 11.76 inches, which is 54 percent of the mean, while precipitation at the City of Santa Barbara was 9.06 inches or 49 percent of the mean.

The Santa Barbara Weather Modification Project was continued for the third year as a cooperative investigation to provide data to statistically test the effectiveness of weather modification operations. The participants in the project included the University of California, Ventura County, The Santa Barbara County Water Agency, North American Weather

Consultants, and the Department of Water Resources. There were nine seeding opportunities during the period January 5, 1959 through May 1, 1959, of which five were seeded. Ground based silver iodide smoke generators operated a total of 1233 hours on this project.

Los Angeles Region (No. 4)

The Los Angeles Region received only about one-half of its normal rainfall during the 1958-59 season. Data presented in Table 4 show that the average indexes for the individual hydrologic units in the region varied from a maximum of 60 percent of the mean for the 50-year period in the Upper Ojai Valley of western Ventura County, to a minimum of 36 percent in Pleasant Valley in the southeastern part of that county. Precipitation measured at the United States Weather Bureau Station at Los Angeles was 5.58 inches or 38 percent of normal, which is the lowest seasonal amount of precipitation ever recorded at the station.

Weather modification operations were conducted in both Los Angeles and Ventura Counties during the 1958-59 season. Seeding in Ventura County was conducted as a part of the Santa Barbara Weather Modification Project and ground-based silver iodide generators were operated for 621 hours. The Los Angeles County Flood Control District logged 183 hours for ground-based silver iodide generators during the period October 23, 1958, through September 13, 1959, seeding clouds in the San Gabriel Mountains above San Gabriel Dam.

Lahontan Region (No. 6)

Indexes of precipitation for stations in the Lahontan Region indicate that the 1958-59 season averaged 67 percent of the mean for the

TABLE 4

AVERAGES OF INDEXES OF PRECIPITATION FOR STATIONS
IN HYDROLOGIC UNITS IN LOS ANGELES REGION (NO. 4)
FOR THE 1958-59 SEASON

Hydrologic unit	Areal designation code	Number of stations	Average index
Upper Ojai Valley	4- 1.00	2	60
Ojai Valley	4- 2.00	2	59
Ventura River Valley	4- 3.00	8	53
Santa Clara River Valley	4- 4.00	26	50
Acton Valley	4- 5.00	3	55
Pleasant Valley	4- 6.00	1	36
Arroyo Santa Rosa Valley	4- 7.00	1	42
Las Posas Valley	4- 8.00	6	45
Simi Valley	4- 9.00	2	46
Coastal Plain, Los Angeles County	4-11.00	65	49
San Fernando Valley	4-12.00	35	51
San Gabriel Valley	4-13.00	70	50
Upper Santa Ana Valley, Los Angeles County	4-14.00	7	44
Malibu Coastal Group	4-16.00	4	46
Los Angeles Region		232	50

50-year period 1897-98 through 1946-47. It will be noted from the data presented in Table 5 that the average index varied from a minimum of 35 percent at Rose Valley, to a maximum of 131 percent in the Middle Mojave River Valley. However, there is a paucity of stations in the Lahontan Region and available data may not be truly indicative of area-wide conditions. For example, the high indexes noted for the Mojave River and Ivanpah Valleys were due primarily to high intensity summer thunderstorms which affected only limited areas. Since the few gages in these Units were so located that they happened to record some of these localized storms, the statistics in Table 5 suggest a better water supply year than the balance of the Southern California area.

Weather modification activities in the Lahontan Region within the Southern California District area were limited to the Mammoth Lake area. Here the Weather Modification Company seeded with silver iodide for a total of four hours using air-borne techniques.

TABLE 5

AVERAGES OF INDEXES OF PRECIPITATION FOR STATIONS IN HYDROLOGIC UNITS IN LAHONTAN REGION (NO. 6) FOR THE 1958-59 SEASON

Hydrologic unit	Areal designation code	Number of stations	Average index
Mono Valley	6- 9.00	2	47
Long Valley	6-11.00	1	76
Owens Valley	6-12.00	7	63
Deep Springs Valley	6-15.00	1	48
Death Valley	6-18.00	1	87
Riggs Valley	6-23.00	1	91
Ivanpah Valley	6-30.00	1	113
Lower Mojave River Valley	6-40.00	2	127
Middle Mojave River Valley	6-41.00	1	131
Upper Mojave River Valley	6-42.00	4	45
Antelope Valley	6-44.00	18	64
Searles Valley	6-52.00	1	66
Rose Valley	6-56.00	2	35
Southern Lahontan Region		42	67

Colorado River Basin Region (No. 7)

The averages of indexes of seasonal precipitation for stations in the Colorado River Basin Region shown in Table 6 indicate the precipitation was approximately 42 percent of the 50-year mean. However, available data are very limited and there are no data for over two-thirds of the hydrologic units in this region. The average of indexes varies from a high of 78 percent of the mean in Borrego Valley, to a low of 9 percent in East Salton Sea Valley. Measured precipitation was 0.36 inch at Brawley and 2.93 inches at Blythe, representing 15 percent and 73 percent of their 50-year means, respectively.

There were no reports of weather modification activities in this region during the 1958-59 season.

TABLE 6

AVERAGES OF INDEXES OF PRECIPITATION FOR STATIONS IN HYDROLOGIC UNITS IN COLORADO RIVER BASIN REGION (NO. 7) FOR THE 1958-59 SEASON

Hydrologic unit	Areal designation code	Number of stations	Average index
Ward Valley	7- 3.00	1	31
Chuckawalla Valley	7- 5.00	1	10
Twentynine Palms Valley	7-10.00	1	57
Means Valley	7-17.00	1	47
Lucerne Valley	7-19.00	1	67
Morongo Valley	7-20.00	1	69
Coachella Valley	7-21.00	7	48
Borrego Valley	7-24.00	1	78
Terwilliger Valley	7-26.00	1	48
San Felipe Valley	7-27.00	1	69
Coyote Wells Valley	7-29.00	1	14
Imperial Valley	7-30.00	4	18
Orcopia Valley	7-31.00	1	32
East Salton Sea Valley	7-33.00	1	2
Palo Verde Valley	7-38.00	2	51
Calzona Valley	7-41.00	1	55
Needles Valley	7-44.00	1	38
Colorado River Basin Region		27	42

Santa Ana Region (No. 8)

Precipitation in the Santa Ana Region for the 1958-59 season was generally less than 50 percent of the long time mean for the period 1897-98 through 1946-47. However, as indicated by the summary presented in Table 7, most of the stations are located in the Coastal Plain of Orange County and Upper Santa Ana Valley where precipitation averaged 45 percent and 43 percent of the long time mean, respectively. Bear Valley in the San Bernardino Mountain area had an index of 76 percent based on one station located at Big Bear Lake Dam. Although this station had the highest index in the region, much of the precipitation came from local thunderstorms of high intensity which occurred during the summer months. Measured precipitation at the United States Weather Bureau Station in the City of Santa Ana was 6.41 inches or 45 percent of the mean.

TABLE 7

AVERAGES OF INDEXES OF PRECIPITATION FOR STATIONS IN HYDROLOGIC UNITS IN SANTA ANA REGION (NO.8) FOR THE 1958-59 SEASON

Hydrologic unit	Areal designation code	Number of stations	Average index
Coastal Plain, Orange County	8-1.00	36	45
Upper Santa Ana Valley	8-2.00	40	43
Elsinore Valley	8-4.00	1	33
San Jacinto Valley	8-5.00	2	49
Bear Valley	8-9.00	1	76
Santa Ana Region		80	44

During the 1958-59 season weather modification operations were conducted in the Upper Santa Ana River Valley by the Upper Santa Ana River

Weather Corporation. This company used ground-based silver iodide generators for a total of 2,106 hours between October 23, 1958, and September 13, 1959.

San Diego Region (No. 9)

The average of indexes of precipitation for the 1958-59 season, based on 34 stations in San Diego County, was just under 50 percent of the 50-year mean. As shown in Table 8, the precipitation varied from a low of 36 percent of the mean in Poway Valley, to a high of 56 percent of the mean in the Santa Margarita Valley. Precipitation at the City of San Diego measured 5.28 inches or 51 percent of the mean.

There were no reports of weather modification operations in the San Diego Region during the 1958-59 season.

TABLE 8

AVERAGES OF INDEXES OF PRECIPITATION FOR STATIONS IN HYDROLOGIC UNITS IN SAN DIEGO REGION (NO.9) FOR THE 1958-59 SEASON

Hydrologic unit	Areal designation code	Number of stations	Average index
San Juan Valley	9- 1.00	3	52
Santa Margarita Valley	9- 4.00	6	56
Coahuila Valley	9- 6.00	1	41
San Luis Rey Valley	9- 7.00	2	44
Warner Valley	9- 8.00	3	44
San Pasqual Valley	9-10.00	2	44
Santa Maria Valley	9-11.00	2	44
Poway Valley	9-13.00	1	36
Mission Valley	9-14.00	6	51
San Diego River Valley	9-15.00	3	46
Sweetwater Valley	9-17.00	3	45
Otay Valley	9-18.00	1	45
Tia Juana Valley	9-19.00	1	49
San Diego Region		34	48

Runoff

Runoff from mountain areas in Southern California was generally far below normal during the water year 1958-59, reflecting the 1958-59 seasonal characteristics of the precipitation. Based on the mean for the 53-year period 1894-95 through 1946-47, the estimated seasonal unimpaired runoff of the Arroyo Seco at the station near Pasadena was 22 percent of normal. Similar values for the Santa Ana River near Mentone, Sespe Creek near Fillmore, and Huasna River near Santa Maria, were 44 percent, 34 percent, and 6 percent of the mean, respectively.

Runoff from streams in the easterly desert areas was also below normal. The estimated unimpaired seasonal runoff of the Owens River below Long Valley about 73 percent of the 53-year mean, and the discharge in Deep Creek near Valyermo was 35 percent of normal. The flow in the Coloradc River measured at Lee's Ferry, Arizona, was about 57 percent of the average for the 34-year period 1922-23 through 1955-56.

The estimated or measured seasonal unimpaired runoff during the 1958-59 season at selected stations representative of conditions in Southern California is presented in Table 9. This table also shows a comparison of the 53-year mean runoff with the estimated or measured minimum and maximum runoff for each station during the period of record. The historical seasonal natural runoff for the period 1894 to the present for certain of these streams is delineated on Plate 4, together with accumulated deviation from the mean.

TABLE 9

ESTIMATED 1958-59 SEASONAL NATURAL RUNOFF AT
SELECTED STATIONS IN SOUTHERN CALIFORNIA

In acre-feet

Station	Period of record	1958-59	53-year mean	Maximum[b]		Minimum[b]	
				Season	Quantity	Season	Quantity
Central Coastal Region							
Arroyo Grande at Arroyo Grande	1939 to date	5,760[c]	23,900	1906-07	76,200	1930-31	800
Huasna River near Santa Maria	1929 to date	1,270	20,600	1906-07	74,400	d	0
Los Angeles Region							
Sespe Creek near Fillmore	1911-13 1927 to date	31,920	93,900	1940-41	376,000	1950-51	3,520
Arroyo Seco near Pasadena	1910 to date	1,610	7,300	1921-22	25,400	1898-99	160
Santa Anita Creek near Sierra Madre	1916 to date	2,190	4,920	1942-43	16,600	1898-99	210
San Gabriel River near Azusa	1894 to date	43,180	122,000	1921-22	410,000	1898-99	9,620
Lahontan Region							
Owens River below Long Valley	1916 to date	122,600	168,500	1906-07	292,000	1930-31	73,010
Rock Creek near Valyermo	1923-37 1938 to date	5,190	15,000	1921-22	39,000	1950-51	1,380
Deep Creek near Hesperia	1904-22 1929 to date	16,150	47,100[e]	1921-22	177,000[f]	1950-51	4,340[f]
Colorado River Basin Region							
Colorado River at Lees Ferry	1911 to date	6,748,700[c]	11,880,000[cg]	1916-17	21,860,000[cf]	1933-34	4,377,000[cf]
Colorado River at Hoover Dam	1933 to date	9,757,500[c]	11,168,000[ch]	1941-42	17,880,000[cf]	1933-34	5,058,000[cf]

ESTIMATED 1958-59 SEASONAL NATURAL RUNOFF AT SELECTED STATIONS IN SOUTHERN CALIFORNIA (continued)

In acre-feet

Station	Period of record	1958-59	53-year mean	Maximum[b] Season	Maximum[b] Quantity	Minimum[b] Season	Minimum[b] Quantity
Colorado River Basin Region (continued)							
Colorado River at Yuma	1878 to date	1,119,800[ci]	5,646,000[ch]	1908-09	26,070,000[cf]	1955-56	894,000[cf]
Palm Canyon Creek near Palm Springs	1930-41 1947 to date	170	3,580[j]	1936-37	18,980[f]	1955-56	0.2[f]
Santa Ana Region							
Cucamonga Creek near Upland	1928 to date	3,450	6,190	1921-22	20,900	1898-99	930
Santa Ana River near Mentone	1896 to date	21,600	70,600	1915-16	280,000	1950-51	13,090
San Diego Region							
Murrieta Creek at Temecula	1930 to date	690	8,670	1915-16	60,300	1933-34	420
Santa Ysabel Creek at Sutherland Dam	1912-28 1936 to date	780	15,200	1915-16	95,200	1954-55	700
Cottonwood Creek at Morena Dam	1911 to date	300	12,400	1915-16	75,300	1955-56	130

a. Mean for period 1894-95 through 1946-47, except as noted.
b. Indicated maxima and minima are recorded or estimated values for period 1894-95 to date, except as noted.
c. Measured runoff, unadjusted for upstream development.
d. Zero flow reported for eleven seasons.
e. Average for period 1920-21 through 1949-50.
f. Indicated maxima and minima are recorded or estimated values for given period of record.
g. Average for period 1922-23 through 1955-56.
h. Average for period 1936-37 through 1955-56.
i. Includes discharges from Yuma Main Canal Wasteway and California Drainage Canal.
j. Average for period 1930-31 through 1940-41, and 1947-48 through 1957-58.

Discharge to the Ocean

Since the 1958-59 season was one of subnormal water supply, the major portion of the runoff which occurred was conserved either in surface reservoirs, by streambed percolation, or by the artificial recharge activities of a number of local agencies. Despite these activities a portion of the runoff was discharged to the ocean. For the most part, this flow represented runoff from urban areas near the coast where conservation is not economically feasible. An additional portion represented high-intensity flows which were flashy in nature and cannot be completely conserved by reasonable means.

The runoff to the ocean during 1958-59 from the 17 streams which drain most of coastal Southern California is presented in Table 10. For comparative purposes the discharge from these streams during the wet 1957-58 season is also shown. It will be noted that the discharge during the 1958-59 season was roughly 10 percent of that observed during the previous year. It will also be noted that about 70 percent of the flow was discharged in streams draining the highly urbanized Los Angeles County.

Storage in Surface Reservoirs

The volume of water stored in reservoirs in Southern California generally decreased during the 1958-59 season, another manifestation of the dry year. Those increases which did occur were the result of the delivery of imported water for regulatory storage. Storage in selected surface reservoirs in, or supplying water to, Southern California is presented in Table 11 for both October 1, 1958 and October 1, 1959.

TABLE 10

ESTIMATED SEASONAL DISCHARGE TO THE OCEAN DURING 1957-58 AND 1958-59 FROM SELECTED STREAMS IN SOUTHERN CALIFORNIA

Stream	Discharge, in acre-feet 1957-58	Discharge, in acre-feet 1958-59
Central Coastal Region		
Santa Maria River	126,950	0
Santa Ynez River	176,500	11,960
Los Angeles Region		
Ventura River	160,600	5,960
Santa Clara River	279,300	19,310
Ballona Creek	51,450	17,170
Dominguez Channel	30,080	13,270
Los Angeles River	191,100	49,390
Los Cerritos Channel	9,630	2,410
San Gabriel River	38,970*	5,750*
Santa Ana Region		
Santa Ana River	17,370	340
Santa Ana Delhi Drain	3,400	790
Peters Canyon Drain	3,150	240
San Diego Region		
Aliso Creek	1,380	3
Trabuco Creek	11,990	30
San Juan Creek	27,560	1,590
Santa Margarita River	32,350	0
San Luis Rey River	2,710	0
TOTALS	1,164,490	128,213

* Includes discharge from Coyote Creek.

The total amount of local water stored in reservoirs with capacities of 10,000 acre-feet, or more, in coastal Southern California amounted to 306,700 acre-feet, on October 1, 1959. This amounted to about 23 percent of capacity, considerably less than the storage of 41 percent of capacity on October 1, 1958. Reservoirs storing both local and imported, or just imported waters, contained 648,800 acre-feet, or 33 percent of capacity on October 1, 1959. Reservoir storage in San Diego County

TABLE 11

WATER IN STORAGE IN SELECTED SURFACE RESERVOIRS
IN, OR SUPPLYING WATER TO, SOUTHERN CALIFORNIA
ON OCTOBER 1, 1958 AND OCTOBER 1, 1959

Watershed	Reservoir	Capacity in acre-feet	Water in storage in acre-feet		Storage, in percent of capacity	
			October 1, 1958	October 1, 1959	October 1, 1958	October 1, 1959
Central Coastal Region						
Santa Ynez River	Gibraltar	15,600	12,420	9,500	80	61
	Cachuma	206,500	196,890	187,090	95	91
Los Angeles Region						
Piru Creek	Lake Piru	100,000	19,700	6,390	20	6
Bouquet Creek	Bouquet Canyon	36,500	26,210[a]	33,420[a]	72	92
San Gabriel River	Morris	35,170	23,050	22,120	66	63
Lahontan Region						
Rush Creek	Grant Lake	47,530	43,960[b]	17,240[b]	92	36
Owens River	Long Valley (Lake Crowley)	183,470	178,760[b]	115,760[b]	97	63
Rose Valley	Haiwee	58,530	48,390[b]	41,920[b]	83	72
Colorado River Basin Region						
Colorado River	Lake Mead	27,207,000	23,326,000	20,036,000	86	74
	Lake Mohave	1,810,000	1,522,200	1,385,700	84	77
	Lake Havasu	688,000	556,200	555,400	81	81
Santa Ana Region						
Bear Creek	Bear Valley	72,170	21,430	13,150	30	18
San Jacinto River	Lake Hemet	13,400	7,160	5,120	53	38
	Railroad Canyon	14,700	2,110[c]	1,170[c]	14	8
Cajalco Creek	Lake Mathews	100,000	38,300[c]	56,980[c]	38	57
Santiago Creek	Santiago	25,000	19,860[c]	10,210[c]	79	41

WATER IN STORAGE IN SELECTED SURFACE RESERVOIRS
IN, OR SUPPLYING WATER TO, SOUTHERN CALIFORNIA
ON OCTOBER 1, 1958 AND OCTOBER 1, 1959
(continued)

Watershed	Reservoir	Capacity in acre-feet	Water in storage in acre-feet		Storage, in percent of capacity	
			October 1, 1958	October 1, 1959	October 1, 1958	October 1, 1959
San Diego Region						
Temecula Creek	Vail	49,500	6,850	3,110	14	6
San Luis Rey River	Lake Henshaw	194,320	20,070	3,750	10	2
Santa Isabella Creek	Sutherland	29,680	6,480	6,270	22	21
San Dieguito River	Lake Hodges	33,550	7,000[d]	2,500[d]	21	7
San Vicente Creek	San Vicente Lake	90,230	71,840[d]	48,950[d]	80	54
Boulder Creek	Cuyamaca	11,600	0	0	0	0
San Diego River	El Capitan Lake	112,810	43,520	22,830	39	20
Sweetwater River	Lake Loveland	25,390	370	790	2	3
	Sweetwater	27,690	10,370[d]	5,010[d]	37	18
Cottonwood Creek	Morena Lake	50,210	1,020	880	2	2
Cottonwood Creek	Barrett Lake	44,760	930	1,130	2	2
Otay River	Lower Otay Lake	56,520	15,030	5,580	27	10

a. Includes water imported through Los Angeles Aqueduct from Owens River.
b. Storage in reservoirs in the Los Angeles Aqueduct System in Mono and Owens Basins.
c. Includes Colorado River water imported via Colorado River Aqueduct.
d. Includes Colorado River water imported via Colorado River Aqueduct and San Diego Aqueduct.

decreased from 183,500 acre-feet on October 1, 1958, to 99, 920 acre-feet, or 14 percent of capacity, on October 1, 1959, despite the importation of 110,650 acre-feet of Colorado River water during the year.

Total storage in three major reservoirs of the Los Angeles Department of Water and Power in the Owens Valley decreased from 94 percent of capacity on October 1, 1958, to 60 percent of capacity on October 1, 1959. These reservoirs are primarily used for the regulation of flow through the Los Angeles Aqueduct.

Storage in Lake Mead on the Colorado River was 20,036,000 acre-feet on October 1, 1959. It decreased 3,290,000 acre-feet, or 12 percent, during the 1958-59 water year.

The water surface elevation of the Salton Sea as of October 1, 1959, was 234.8 feet below sea level, reflecting a decrease of 0.1 foot in elevation since October 1, 1958.

Colorado River Diversions

The total diversion of water from the Colorado River by principal water agencies in California amounted to approximately 4,588,000 acre-feet during the 1958-59 water year. This figure represents an increase of 11 percent over the previous year; all agencies increased their diversions. The volume of water diverted by each of the principal diversion agencies in California during the 1957-58 and the 1958-59 water years is presented in Table 12.

TABLE 12

QUANTITY AND PERCENT CHANGE IN AMOUNT OF WATER
DIVERTED FROM THE COLORADO RIVER FOR USE IN
CALIFORNIA DURING 1957-58 AND 1958-59

Diverted by	Diversion, in acre-feet 1957-58	Diversion, in acre-feet 1958-59	Percent change
The Metropolitan Water District of Southern California	534,980	655,950	+ 23
Palo Verde Irrigation District	342,500	448,210	+ 31
Imperial Irrigation District	2,737,100	2,940,210	+ 7
Coachella Valley County Water District	498,940	508,000	+ 2
Yuma Project (Reservation Division)	9,520	35,790	+276
TOTALS	4,123,040	4,588,160	+ 11

Importation to Coastal Southern California

Water imported to coastal Southern California through the combined facilities of The Metropolitan Water District of Southern California and the City of Los Angeles Department of Water and Power totaled 991,000 acre-feet during the 1958-59 season. This represents an increase of 121,000 acre-feet over the volume imported during the 1957-58 water year. The historical amounts of water imported to coastal Southern California are presented graphically on Plate 5.

Deliveries through the Colorado River aqueduct, measured at the Hayfield Pumping Plant, totaled about 647,000 acre-feet. This was about 112,000 acre-feet or 21 percent greater than the import during 1957-58. Deliveries of water to member agencies of The Metropolitan Water District of Southern California totaled about 609,000 acre-feet during the water year, an increase of about 10 percent over the 1957-58 season. The volumes of Colorado River water delivered to each of the coastal counties during 1957-58 and 1958-59 are presented in Table 13. The difference between the volume of imported water measured at the Hayfield Pumping Plant and the deliveries to the various counties shown in Table 13, is accounted for by an increase of about 19,000 acre-feet in the storage level at Lake Mathews, and by aqueduct and distribution system losses.

TABLE 13

COLORADO RIVER WATER IMPORTED TO COUNTIES IN
COASTAL SOUTHERN CALIFORNIA DURING 1957-58 AND 1958-59

Area	Seasonal import, in acre-feet		Percent
	1957-58	1958-59	change
Los Angeles County	262,050	316,250	+ 21
Orange County	126,800	138,450	+ 9
Riverside County	24,250	39,900	+ 64
San Bernardino County	4,950	4,050	- 18
San Diego County	135,600	110,650	- 18
TOTALS	553,650	609,300	+ 10

Table 13 indicates a substantial increase in the deliveries to Los Angeles County and a lesser increase to Orange County. These increases occurred despite a reduction of about 29,000 acre-feet in the volume of Colorado River water purchased for spreading in Los Angeles County and 6,400 acre-feet for spreading in Orange County.

A total of 344,000 acre-feet of water, which is the estimated flow from Fairmont Reservoir, was imported into the Los Angeles area from the Owens River-Mono Basin area through the aqueduct of the City of Los Angeles, Department of Water and Power. This aqueduct was operated at capacity during the entire 1958-59 water year, with the exception of short periods of shutdown for routine maintenance and inspection.

Sewage Discharge to Saline Waters

During the 1958-59 fiscal year, approximately 700,000 acre-feet of sewage was discharged to saline waters of the Pacific Ocean and tidal estuaries through 15 outfalls along the coast of Southern California. Table 14 presents the discharge through each of these outfalls for 1958-59 together with the disposal for 1957-58, which is presented for comparison purposes. The totals in this table indicate that the 1958-59 discharge was 5 percent greater than that observed during the 1957-58 year. This reflects increased water use, expanding population with associated increased urban development, and the extension of sewers into urban areas formerly served by cesspools and septic tanks.

TABLE 14

SEWAGE DISCHARGED TO SALINE WATERS IN 1957-58 AND 1958-59
FROM MAJOR SEWERAGE SYSTEMS IN SOUTHERN CALIFORNIA

Station	Discharge, in acre-feet		Percent change
	1957-58	1958-59	
City of Santa Barbara	5,540	5,240	- 5
City of Ventura	3,490	4,000	+14
City of Oxnard	4,010	3,320	-17
Point Hueneme Sanitary District	840	1,380	+64
Port Hueneme-U.S.Navy Construction Battalion	720	760	+ 6
City of Los Angeles			
Hyperion	299,360	293,790	- 2
Terminal Island	6,910	6,950	+ 1
County Sanitation Districts of Los Angeles County	239,290	263,650	+10
Orange County Sanitation Districts of Orange County	45,280	53,850	+19
Laguna Beach	940	1,530	+64
City of San Clemente	660	840	+27
City of Oceanside	2,050	2,050	0
City of San Diego	49,910	51,500	+ 3
City of Chula Vista	2,530	2,800	+11
International Outfall Sewer	4,960	4,980	0
TOTALS	666,490	696,640	+ 5

CHAPTER III GROUND WATER SUPPLY CONDITIONS

It was shown in Chapter II that the 1958-59 water crop was far below normal. The reaction of the ground water basins, indicated by a comparison of water level measurement taken in the spring of 1958 and the spring of 1959, did not everywhere reflect this condition. Substantial raises in water levels were observed in a number of basins situated adjacent to the mountains or where there were large scale artificial recharge activities. A brief discussion of these recharge activities, ground water supply conditions, and the many ground water basins in the Southern California District during the 1958-59 season, is presented in this chapter.

Artificial Recharge

Artificial recharge for the replenishment of ground water basins and conservation of surface runoff is widely practiced in Southern California. During the 1958-59 water year, a total of about 215,000 acre-feet of local and imported waters was reported spread or injected at 62 projects. Of this amount, approximately 109,000 acre-feet, or about 50 percent, consisted of imported Colorado River water. As will be pointed out in subsequent parts of this chapter, artificial recharge activities were instrumental in maintaining or increasing water levels in a number of basins. Table 15 presents the measured or estimated amounts of water spread at the various projects for which there are quantitative reports of activity during the 1958-59 water year.

TABLE 15

SUMMARY OF PRINCIPAL ARTIFICIAL RECHARGE ACTIVITIES IN SOUTHERN CALIFORNIA DURING THE 1958-59 WATER YEAR

Hydrologic unit	Areal designation code	Agency conducting spreading operation[a]	Number of projects operated	Reported or estimated amount spread, in acre-feet
Ojai Valley	4- 2.00	VCFCD	1	1,330
Santa Clara River Valley	4- 4.00			
Oxnard Plain Forebay Area	4- 4.02	UWCD	2	34,810
Piru Basin	4- 4.06	UWCD	1	3,880
Coastal Plain, Los Angeles County	4-11.00			
West Coast Basin	4-11.02	LACFCD	2	3,730[b]
Montebello Forebay Area	4-11.05	LACFCD	3	36,580[c]
San Fernando Valley	4-12.00			
San Fernando Basin	4-12.01	LACFCD	3	1,370
		LADW&P	1	9,040
Tujunga Basin	4-12.05	LACFCD	1	0
San Gabriel Valley	4-13.00			
Main San Gabriel Basin	4-13.01	LACFCD	6	3,580
Monk Hill Basin	4-13.02	LACFCD	1	350
Pasadena Subarea	4-13.03	LACFCD	1	130
Santa Anita Subarea	4-13.04	LACFCD	1	180
		CSMWD	1	370
Upper Canyon Basin	4-13.05	DMWC	1	7,940[d]
		SGRSC	1	16,430
Glendora Basin	4-13.07	GIC	1	20
		LACFCD	1	140
Upper Santa Ana Valley				
Los Angeles County	4-14.00			
Claremont Heights Basin	4-14.04	PVPA	2	10
		CPWD	1	2,620
Coastal Plain, Orange County	8- 1.00			
Santa Ana Forebay Area	8- 1.02	OCWD & SAVIC	2	69,050[e]
		AUWC	2	5,060[f]
		OCFCD	1	430
Irvine Basin	8- 1.03	OCWD	2	430[g]
Yorba Linda Basin	8- 1.05	AUWC	1	1,360
Santa Ana Narrows Basin	8- 1.06	AUWC	1	3,990[h]

SUMMARY OF PRINCIPAL ARTIFICIAL RECHARGE ACTIVITIES
IN SOUTHERN CALIFORNIA DURING THE 1958-59 WATER YEAR
(continued)

Hydrologic unit	Areal designation code	Agency conducting spreading operation[a]	Number of projects operated	Reported or estimated amount spread, in acre-feet
Upper Santa Ana Valley	8- 2.00			
Chino Basin	8- 2.01	SBCFCD	2	240
		EWC	2	390
Cucamonga Basin	8- 2.03	SAWC	1	1,090
		SBCFCD	1	90
Bunker Hill Basin	8- 2.06	SBVWCD	3	2,360
		SBCFCD	1	460
Lytle Basin	8- 2.07	FUWC	1	5,320
Devil Canyon Basin	8- 2.10	SBCFCD	1	1,610
Beaumont Basin	8- 2.12	RCFC&WCD	1	5
Temescal Basin	8- 2.17	RCFC&WCD	1	70
Coldwater Basin	8- 2.19	TWC	3	400
Lee Lake Basin	8- 2.20	TWC	3	60
San Jacinto Valley	8- 5.00	RCFC&WCD	1	130
Total local and imported water reported spread				215,055
Total imported water reported spread				109,100
Total local water reported spread				105,955

a. Abbreviations of agencies conducting spreading operations are presented in alphabetical order: AUWC-Anaheim Union Water Company; CPWD-City of Pomona Water Department; CSMWD-City of Sierra Madre Water Department; DMWC-Duarte Mutual Water Company; ESWC-East Side Water Committee; EWC-Etiwanda Water Company; FUWC-Fontana Union Water Company; GIC-Glendora Irrigation Company; LACFCD-Los Angeles County Flood Control District; LADW&P-Los Angeles Department of Water and Power; OCFCD-Orange County Flood Control District; OCWD-Orange County Water District; PVPA-Pomona Valley Protective Association; RCFC&WCD-Riverside County Flood Control and Water Conservation District; SAWC-San Antonio Water Company; SBCFCD-San Bernardino County Flood Control District; SBVWCD-San Bernardino Valley Water Conservation District; SGRSC-San Gabriel River Spreading Corporation; SAVIC-Santa Ana Valley Irrigation Company; TWC-Temescal Water Company; UWCD-United Water Conservation District; VCFCD-Ventura County Flood Control District.

b. Includes about 3,640 acre-feet of softened Colorado River water.
c. Includes approximately 29,000 acre-feet of unsoftened Colorado River water diverted to spreading grounds. An additional volume of approximately 25,400 acre-feet was purchased. This volume percolated in the unlined portions of the Rio Hondo and the San Gabriel River between the points of release and the points of diversion to the spreading grounds.
d. Amount reported through August only.
e. Includes about 68,800 acre-feet of unsoftened Colorado River water.
f. Includes about 4,360 acre-feet of unsoftened Colorado River water.
g. Total quantity is unsoftened Colorado River water.
h. Includes about 2,850 acre-feet of unsoftened Colorado River water.

Ground Water Conditions

As a general rule, dry years from the standpoint of surface supply are accompanied by declining ground water levels. For a large number of ground water basins in Southern California the dry 1958-59 season was no exception and, in coastal basins, conditions favorable to sea-water intrusion were intensified. However, there were a number of basins, particularly small ones located adjacent to mountains, where there were increases in water levels between the spring of 1958 and spring 1959. In some instances, these rises were substantial. Artificial recharge activities are an important cause for this anomaly, although a contributing factor is some very late spring runoff from the wet year of 1958 occurring after the spring 1958 ground water level measurements.

Discussions of ground water conditions in the various regions and basins in the Southern California area are presented in the following sections. The ground water elevations of selected wells are shown by the hydrographs presented on Plates 12A and 12B.

Central Coastal Region (No. 3)

Water levels in ground water basins generally decreased in elevation between the spring of 1958 and the spring of 1959 in San Luis

Obispo County. On the other hand, in Santa Barbara County, water levels increased slightly in all basins for which there are observed data, with the exception of the downstream basins of the Santa Ynez River watershed. Observed ground water level elevations were generally above sea level in all areas within the region except for the South Coast Basins of Santa Barbara County.

Available ground water level records for the Central Coastal Region, for the period July 1958 through June 1959, are tabulated in Volume II, Appendix A. The estimated average change in ground water level elevations between the spring of 1958 and the spring of 1959 for selected basins in this region are given in Table 16. The historical fluctuations of water levels at key wells in Region 3 are delineated on Plate 12A and the locations of wells at which water level fluctuations are shown can be found on Plate 6.

Ground water levels in the Paso Robles Basin of the Upper Salinas Valley declined an average of four feet between the spring of 1958 and the spring of 1959. Depths to ground water ranged from flowing, just west of Shandon, to 198 feet below the ground surface in the vicinity of the City of Paso Robles.

Ground water level observations in the Arroyo Grande Basin indicated an average decline of over four feet during the year. It is noted that, in the spring of 1959, the static ground water level was observed to be about 14 feet below sea level at one well located about one mile from the ocean just north of Oceano. However, water levels in all other wells observed were recorded as being above sea level.

In the Santa Maria River Valley, ground water levels rose an average of seven feet. Observed depths to ground water ranged from a

TABLE 16

ESTIMATED AVERAGE CHANGES IN GROUND WATER LEVEL ELEVATIONS IN SELECTED VALLEYS AND BASINS IN CENTRAL COASTAL REGION (NO. 3) DURING 1958-59

Ground water basin: Name	Areal designation code	Number of wells considered in analysis	Estimated average change in ground water level during the year, in feet	Location and observed extremes of depth to ground water during 1958-59, in feet: Maximum	Minimum
Salinas Valley	3- 4.00				
Paso Robles Basin	3- 4.06	29	- 4	26S/12E-26E1,M 193.0	26S/14E-14R1,M Flowing
San Luis Obispo Group	3- 8.00				
Los Osos Basin	3- 8.03	2	+ 4	3S/11E- 7K1,M 42.4	30S/11E-21E1,M 13.7
San Luis Obispo Basin	3- 8.04	4	- 4	30S/12E-32J1,M 15.9	31S/12E-28N1,M 10.4
Pismo Basin	3- 8.05	2	- 7 1/2	31S/13E-16N1,M 29.7	32S/12E-13R1,M 4.8
Arroyo Grande Group	3-11.00				
Arroyo Grande Basin	3-11.01	12	- 4 1/2	32S/13E-29N1,M 77.0	12N/35W-30P1,S 5.0
Nipomo Mesa Basin	3-11.02	2	- 3 1/2	11N/34W-19F1,S 292.5	11N/35W- 7R1,S 57.2
Santa Maria River Valley	3-12.00	26	+ 7	9N/33W-18C1,S 506.9	11N/35W-20E1,S 12.1
Cuyama River Valley	3-13.00	9	+ 3 1/2	9N/26W- 4J1,S 294.4	10N/27W-11H1,S 20.5
San Antonio Creek Valley	3-14.00	3	+ 1	8N/32W-35Q1,S 146.3	8N/32W-30K2,S 7.2

ESTIMATED AVERAGE CHANGES IN GROUND WATER LEVEL ELEVATIONS IN SELECTED VALLEYS AND BASINS IN CENTRAL COASTAL REGION (NO. 3) DURING 1958-59
(continued)

Ground water basin Name	Areal designation code	Number of wells considered in analysis	Estimated average change in ground water level during the year, in feet	Location and observed extremes of depth to ground water during 1958-59, in feet: Maximum	Minimum
Santa Ynez River Valley	3-15.00				
Lompoc Subarea	3-15.01	97	- 4	7N/34W/12E1,S 305.5	7N/35W-28H2,S 1.8
Santa Rita Subarea	3-15.02	51	- 1/2	7N/33W-23R1,S 144.6	6N/32W-17D3,S 1.5
Buellton Subarea	3-15.03	55	- 1	6N/31W- 6D1,S 105.4	6N/32W-12R2,S 3.5
Santa Ynez Subarea	3-15.04	105	+ 3	7N/30W-29N2,S 244.3	7N/29W-32M1,S 0.8
Headwater Subarea	3-15.05	5	+ 1/2	6N/30W-24H1,S 16.5	6N/30W-24E1,S 2.0
South Coast Basins (Santa Barbara Co.)	3-16.00				
Goleta Basin	3-16.01	21	+ 2	4N/27W- 6Q9,S 244.3	4N/28W-17R1,S Flowing
Carpinteria Basin	3-16.04	23	+ 1/2	4N/25W-26A1,S 294.8	4N/28W-20C1,S 1.8
Carrizo Plain	3-19.00	4	+ 4 1/2	29S/18E-28K1,M 39.0	30S/18E- 2N1,M 15.0

minimum of 12 feet four miles north of Guadalupe, to a maximum of 500 feet below the ground surface three miles east of Orcutt.

Ground water levels rose in the upstream Santa Ynez and Headwater Subareas of the Santa Ynez River Valley, but decreased in the other downstream areas, particularly in the Lompoc Subarea. Despite an average decline of four feet in the Lompoc Subarea, all but one of the observed wells showed ground water levels substantially above sea level.

Ground water levels in the South Coast Basins of Santa Barbara County generally showed a slight rise. However, static water levels at many of the wells in Goleta and Carpinteria Basins were below sea level during the entire 1958-59 season, and a continuation of conditions favorable to sea-water intrusion was indicated. Minimum water level elevations observed during the year were 41 feet below sea level in the Goleta Basin and 28 feet below sea level in the Carpinteria Basin.

Los Angeles Region (No. 4)

Changes in ground water levels in the many basins in this region varied through a very wide range between the spring of 1958 and the spring of 1959, the extremes being an average rise of 50 feet in the Claremont Heights Basin, and an average decline of 34 feet in Zuma Canyon Basin. There were numerous basins where average rises or declines of over 10 feet were observed. Most of the basins with rises in ground water levels were located in the foothill areas, where at least a portion of the rise is attributable to the delayed effect of late seasonal runoff from the wet winter of 1958. In many basins, the rise is also attributed, at least in part, to water spreading in artificial recharge projects. However, levels in most of the coastal ground water basins remained below sea level during the entire period and conditions favorable to sea-water intrusion continued to prevail in these basins.

The estimated average change in ground water level elevation for selected ground water basins in the Los Angeles Region is presented in Table 17, and a complete tabulation of water levels for this region for the period July 1958 to June 1959 is presented in Volume II, Appendix B. Fluctuations of water levels at selected wells are shown on Plate 12A and the locations of the wells themselves are delineated on Plate 7.

In Ventura County, water levels indicate substantial spring-to-spring rises in water surface elevations in nearly all basins in the Santa Clara River Valley, including the Oxnard Plain Forebay and Pressure Areas. These indicated rises are primarily attributed to the release of approximately 60,000 acre-feet of water from Lake Piru between May of 1958 and May of 1959. These releases are made to the natural stream bed of the Santa Clara River for delivery to spreading basins in the Oxnard Plain Forebay area, so that substantial replenishment of the Fillmore and Piru Basins is accomplished concurrently from stream bed percolation.

Despite the improvement in conditions indicated above, ground water levels in a portion of the Oxnard Plain Forebay Area and piezometric levels throughout most of the Oxnard Plain Pressure Area continued to be below sea level. The resulting landward hydraulic gradient maintains conditions which have permitted intrusion of sea water into the area. The extent of this intrusion in the spring of 1959 is discussed in detail in Chapter IV.

Ground water levels declined in all basins of Ventura County not directly affected by the Santa Clara River. Observed depths to ground water in the county ranged from flowing at Ojai, to a maximum depth of approximately 530 feet below the ground surface one mile north of Moorpark.

Between the spring of 1958 and the spring of 1959 ground water levels in the Coastal Plain of Los Angeles County declined an average of less than three feet in all basins except the Montebello Forebay Area. There, as a result of artificial recharge, a large rise in ground water level was indicated. With the exception of the Montebello Forebay Area, nearly all ground water levels were below sea level. The elevation of the "trough" or depression in ground water levels in the West Coast Basin was 80 to 90 feet below sea level, about the same as last year. This trough is currently located about four miles inland from the coast and extends generally in a southeasterly direction from the southerly end of the Charnock Fault through well number 4S/13W-22F2, which is located near the corner of Alameda Street and Sepulveda Boulevard. A large portion of the ground water pressure surface underlying the Central Coastal Plain Pressure Area continued to remain far below sea level, with the elevation of the trough in this area averaging 70 to 80 feet below sea level. An average ground water level rise of 17 feet was observed in the Montebello Forebay Area between the spring of 1958 and the spring of 1959. This change was due, in large part, to the spreading of about 60,000 acre-feet of local and imported Colorado River water in artificial recharge projects adjacent to the Rio Hondo and San Gabriel Rivers.

Observations of ground water levels in the San Fernando Basin indicated a decline averaging over four feet between the spring of 1958 and the spring of 1959, while in Tujunga Basin levels declined over 12 feet. The other ground water basins in the valley showed only a slight change in ground water level elevation. The depths to ground water varied

TABLE 17

ESTIMATED AVERAGE CHANGES IN GROUND WATER LEVEL ELEVATIONS IN SELECTED VALLEYS AND BASINS IN LOS ANGELES REGION (NO. 4) DURING 1958-59

Ground water basin	Areal designation code	Number of wells considered in analysis	Estimated average change in ground water level during the year, in feet	Location and observed extremes of depth to ground water during 1958-59, in feet	
Name				Maximum	Minimum
Ojai Valley	4-2.00	66	-11	4N/22W- 4J1,S 203.3	4N/23W-12B1,S Flowing
Ventura River Valley	4-3.00				
Upper Ventura River Basin	4-3.02	65	- 4	4N/23W-21C5,S 158.9	4N/23W-32B1,S 0.4
Santa Clara River Valley	4-4.00				
Oxnard Plain Pressure Area	4-4.01	100	+ 7	1N/21W- 4P1,S 123.8	1N/22W-18L1,S Flowing
Oxnard Plain Forebay Area	4-4.02	31	+14	2N/22W-23K3,S 80.3	2N/22W-12A1,S 16.5
Mound Pressure Area	4-4.03	7	- 1 1/2	2N/22W- 9K4,S 229.9	2N/23W-11N1,S 7.6
Santa Paula Basin	4-4.04	19	- 1	2N/22W- 3M2,S 214.6	3N/21W-12E2,S 3.0
Fillmore Basin	4-4.05	43	+11	4N/20W-31H1,S 317.5	3N/20W- 3D1,S Flowing
Piru Basin	4-4.06	32	+36	4N/18W-20M1,S 148.8	4N/19W-33D3,S 4.7
Eastern Basin	4-4.07	18	+15	5N/14W-30R1,S 183.5	4N/17W-15N1,S Flowing
Pleasant Valley	4-6.00	41	-13	2N/20W-21L1,S 368.0	2N/21W-35C1,S 36.8

ESTIMATED AVERAGE CHANGES IN GROUND WATER LEVEL ELEVATIONS IN SELECTED VALLEYS AND BASINS IN LOS ANGELES REGION (NO. 4) DURING 1958-59
(continued)

Ground water basin: Name	Areal designation code	Number of wells considered in analysis	Estimated average change in ground water level during the year, in feet	Location and observed extremes of depth to ground water during 1958-59, in feet: Maximum	Minimum
Arroyo Santa Rosa Valley	4- 7.00	8	-13 1/2	2N/19W-21H1,S 290.0	2N/19W-19L1,S 46.7
Las Posas Valley	4- 8.00				
West Las Posas Basin	4- 8.01	5	- 8	2N/21W-12G1,S 347.9	2N/21W-16J1,S 96.1
East Las Posas Basin	4- 8.02	47	- 1 1/2	3N/20W-33M2,S 529.0	2N/19W- 3A4,S 33.4
Simi Valley	4- 9.00	23	- 8 1/2	2N/18W- 1F1,S 324.7	2N/18W- 7R2,S 5.5
Conejo Valley	4-10.00	66	- 7	1N/19W-14K4,S 211.0	1N/19W-15E2,S 2.5
Coastal Plain (Los Angeles County)	4-11.00				
West Coast Basin North	4-11.01	29	- 1/2	1S/15W-25C1,S 194.9	2S/15W-22P1,S 6.7
West Coast Basin	4-11.02	290	- 1 1/2	2S/14W-34C1,S 265.2	5S/13W- 3P9,S Flowing
Central Coastal Plain Pressure Area	4-11.03	259	- 2 1/2	3S/13W-34G1,S 264.2	5S/12W-10H2,S 3.8
Los Angeles Forebay Area	4-11.04	38	- 6 1/2	2S/13W- 2N1,S 440.0	1S/13W-35F1,S 3.4

ESTIMATED AVERAGE CHANGES IN GROUND WATER LEVEL ELEVATIONS IN SELECTED VALLEYS AND BASINS IN LOS ANGELES REGION (NO. 4) DURING 1958-59 (continued)

Ground water basin Name	Areal designation code	Number of wells considered in analysis	Estimated average change in ground water level during the year, in feet	Location and observed extremes of depth to ground water during 1958-59, in feet: Maximum	Minimum
Coastal Plain (Los Angeles County) (continued)					
Montebello Forebay Area	4-11.05	129	+17	1S/12W-33P2,S 329.0	2S/11W- 6M1,S 3.1
Hollywood Basin	4-11.06	1	- 1	1S/14W-18J1,S 131.7	1S/14W-10N1,S 21.9
Los Angeles Narrows Basin	4-11.07	16	- 1	1S/13W- 4L1,S 61.6	1S/13W-10N1,S 19.1
La Habra Basin	4-11.08	9	- 1	3S/11W- 1P1,S 257.0	3S/11W- 2M1,S 2.3
San Fernando Valley	4-12.00				
San Fernando Basin	4-12.01	137	- 4 1/2	2N/15W-24K1,S 299.5	2N/16W-34G1,S Flowing
Sylmar Basin	4-12.03	11	+ 1	3N/15W-34A1,S 144.5	3N/15W-34P6,S 23.7
Pacoima Basin	4-12.04	4	- 6	3N/15W-26G1,S 244.4	3N/15W-36E1,S 12.3
Tujunga Basin	4-12.05	23	- 12 1/2	2N/13W-18N1,S 383.6	2N/14W-14C4,S 7.8
Verdugo Basin	4-12.07	16	- 1 1/2	2N/13W-27N1,S 182.6	1N/13W-10B1,S 38.4

ESTIMATED AVERAGE CHANGES IN GROUND WATER LEVEL ELEVATIONS IN SELECTED VALLEYS AND BASINS IN LOS ANGELES REGION (NO. 4) DURING 1958-59
(continued)

Ground water basin Name	Areal designation code	Number of wells considered in analysis	Estimated average change in ground water level during the year, in feet	Location and observed extremes of depth to ground water during 1958-59, in feet: Maximum	Minimum
San Gabriel Valley	4-13.00				
Main San Gabriel Basin	4-13.01	179	+ 6	1S/12W- 3M1,S 385.0	1S/11W-31C1,S Flowing
Monk Hill Basin	4-13.02	19	+ 2 1/2	1N/12W- 6D2,S 300.9	1N/12W-17D1,S 105.9
Pasadena Subarea	4-13.03	55	- 7	1N/12W-23G1,S 345.2	1N/11W-29K1,S Flowing
Santa Anita Subarea	4-13.04	12	0	1N/11W-21C2,S 190.6	1N/11W-22F1,S 9.7
Upper Canyon Basin	4-13.05	11	- 15 1/2	1N/10W-27K2,S 110.8	1N/10W-23A2,S 3.8
Lower Canyon Basin	4-13.06	8	- 13 1/2	1N/10W-29J1,S 99.1	1N/10W-35B11,S 3.7
Glendora Basin	4-13.07	10	+ 20	1N/ 9W-29C1,S 457.0	1N/11W-15L2,S 11.8
Way Hill Basin	4-13.08	6	+ 12	1S/9W- 8C2,S 208.2	1S/ 9W- 3C6,S 51.3
San Dimas Basin	4-13.09	22	+ 9 1/2	1N/ 9W-35Q5,S 254.2	1S/ 9W-11G1,S 32.7
Foothill Basin	4-13.10	6	- 11	1N/ 9W-36E2,S 157.5	1N/ 9W-35H1,S 30.4
Spadra Basin	4-13.11	2	- 1	1S/ 9W-25G1,S 185.0	1S/ 9W-22J1,S Flowing

ESTIMATED AVERAGE CHANGES IN GROUND WATER LEVEL ELEVATIONS IN SELECTED VALLEYS AND BASINS IN LOS ANGELES REGION (NO. 4) DURING 1958-59 (continued)

Ground water basin Name	Areal designation code	Number of wells considered in analysis	Estimated average change in ground water level during the year, in feet	Location and observed extremes of depth to ground water during 1958-59, in feet: Maximum	Minimum
San Gabriel Valley (continued)					
Puente Basin	4-13.12	4	+ 8	2S/10W-14M1,S 67.1	1S/ 9W-32G2,S 1.5
Upper Santa Ana Valley (Los Angeles County)	4-14.00				
Chino Basin	4-14.01	11	-16	1S/ 8W-28G2,S 277.6	1S/ 8W-31J1,S 126.3
Pomona Basin	4-14.02	10	- 2	1S/ 8W-20B2,S 484.0	1S/ 8W- 9G1,S 14.3
Live Oak Basin	4-14.03	15	+ 2 1/2	1S/ 8W- 5D2,S 246.2	1N/ 8W-32P2,S 53.1
Claremont Heights Basin	4-14.04	20	+50	1S/ 8W-10B1,S 395.0	1N/ 8W-23J1,S 24.0
Tierra Rejada Valley	4-15.00	3	-15	2N/19W-15H2,S 200.5	2N/19W-14P1,S 36.0
Malibu Coastal Group	4-16.00				
Hidden Valley Basin	4-16.01	22	- 5 1/2	1N/20W-25C2,S 112.0	1N/19W-29D3,S 4.5
Russell Basin	4-16.02	4	- 4 1/2	1N/19W-26C1,S 43.0	1N/19W-28A1,S 5.5
Arroyo Sequit Canyon Basin	4-16.05	2	- 9	1S/20W-25E2,S 33.3	1S/20W-25E1,S 19.4

ESTIMATED AVERAGE CHANGES IN GROUND WATER LEVEL ELEVATIONS IN SELECTED VALLEYS AND BASINS IN LOS ANGELES REGION (NO. 4) DURING 1958-59
(continued)

Ground water basin	Areal designation code	Number of wells considered in analysis	Estimated average change in ground water level during the year, in feet	Location and observed extremes of depth to ground water during 1958-59, in feet	
Name				Maximum	Minimum
Malibu Coastal Group (continued)					
Trancas Canyon Basin	4-16.09	5	-17	1S/19W-35F2,S 64.8	1S/19W-35Q1,S 15.7
Zuma Canyon Basin	4-16.10	4	-34	2S/18W- 6E2,S 58.0	2S/18W- 6M2,S 26.9
Ramera Canyon Basin	4-16.11	6	- 7 1/2	2S/18W- 5E1,S 58.4	2S/18W- 5C2,S 6.5
Malibu Creek Basin	4-16.16	8	- 9 1/2	1S/17W-29N1,S 44.3	1S/17W-32L5,S 10.8
Las Flores Canyon Basin	4-16.19	2	-12 1/2	1S/17W-26E1,S 42.1	1S/17W-35E1,S 23.6
Piedra Gorda Canyon Basin	4-16.20	4	+ 1 1/2	1S/17W-36K1,S 263.0	1S/17W-36H2,S 102.0

from flowing in the Northridge area in the western portion of the valley, to over 300 feet below the ground surface at Tujunga.

In the San Gabriel Valley, the seasonal change in ground water levels varied from a decline of over 15 feet in the Upper Canyon Basin, to a maximum rise of 20 feet in Glendora Basin. In the Main San Gabriel Basin, the largest ground water basin in the valley, the average rise was approximately six feet. Depths to ground water in the San Gabriel Valley ranged from rising water at Whittier Narrows, to more than 450 feet below the ground surface near the City of Glendora.

In the eastern part of the San Gabriel Valley, the ground water levels rose in a number of the small ground water basins located adjacent to the mountains. This pattern, apparent in such basins as Glendora, Way Hill, and San Dimas, carried over into the Claremont Heights, Cucamonga, Rialto, and Lytle Basins of the Upper Santa Ana Valley. These ground water basins are quite small and have a history of recovering rapidly during wet seasons. The large rise in ground water levels in a carry-over effect from the wet 1957-58 season, and is supported by a study of water levels which show that, for a large percentage of the wells, most of the recovery occurred during the spring and summer of 1958.

Lahontan Region (No. 6)

Average changes in ground water levels amounted to no more than two feet in most ground water basins in the Lahontan Region between the spring of 1958 and the spring of 1959. The principal exceptions were Rock Creek and Lancaster Basins. However, it should be emphasized that only a small number of wells were measured in many of the ground water basins in the Lahontan Region, and the averages of the changes in ground water level elevation may not truly reflect ground water conditions. In the Lancaster Basin, probably the most thoroughly developed basin of the Lahontan area, measurements at 75 wells indicated a decline in ground water levels of six feet between the spring of 1958 and the spring of 1959. During the same period, ground water levels remained essentially constant in the Mojave River and Harper Valleys, where considerable development has also occurred. The depths to ground water in this region varied from flowing in Harper and Coyote Lake Valleys to over 400 feet below the ground surface in Rock Creek Basin at a point about 25 miles southeast of Palmdale.

All available ground water level data for the Lahontan Region for the 1958-59 season are tabulated in Volume III, Appendix C, and a summary of these data is presented in Table 18. Historical changes in ground water level elevations at selected wells in ground water basins of the Lahontan Region are given on Plate 12B, and the locations of these wells are shown on Plate 8.

Colorado River Basin (No. 7)

Observations of depths to ground water in this region indicated seasonal declines in all but two of the ground water basins. In most of the ground water basins for which data are available, the number of wells measured is very small, so that the average values based on the available data may not truly reflect the change in ground water conditions. The greatest decline was noted in Fenner Valley, where the observed drop in ground water levels was five and one-half feet. The increases indicated for two basins were minor, about one-half foot. Depths to ground water in the Colorado River Basin Region varied from flowing wells

TABLE 18

ESTIMATED AVERAGE CHANGES IN GROUND WATER LEVEL ELEVATIONS IN SELECTED VALLEYS AND BASINS IN LAHONTAN REGION (NO. 6) DURING 1958-59

Ground water basin	Areal designation code	Number of wells considered in analysis	Estimated average change in ground water level during the year, in feet	Location and observed extremes of depth to ground water during 1958-59, in feet	
Name				Maximum	Minimum
Pahrump Valley	6-28.00	3	- 1 1/2	21N/10E-11K1,S 227.0	20S/52E- 6R1,M 9.9
Mesquite Valley	6-29.00	8	0	20N/12E-19F1,S 130.0	19N/13E-19R1,S 10.0
Ivanpah Valley	6-30.00	5	0	15N/15E-13G1,S 370.0	16N/14E-31L1,S 21.5
Soda Lake Valley	6-33.00	4	0	14N/ 9E-30G2,S 77.5	12N/ 8E-27X2,S 19.1
Silver Lake Valley	6-34.00	1	0	15N/ 8E-22R1,S 56.0	15N/ 8E-22R1,S 56.0
Cronise Valley	6-35.00	3	- 1/2	12N/ 7E-30J1,S 47.6	12N/ 7E-18R2,S 14.7
Langford Valley	6-36.00	3	0	4N/ 4W- 8G1,S 340.4	4N/ 3W-18E1,S 37.1
Coyote Lake Valley	6-37.00	5	0	12N/ 2E-31A1,S 55.9	11N/ 2E- 8K1,S Flowing

ESTIMATED AVERAGE CHANGES IN GROUND WATER LEVEL ELEVATIONS IN SELECTED VALLEYS AND BASINS IN LAHONTAN REGION (NO. 6) DURING 1958-59
(continued)

Ground water basin	Areal designation code	Number of wells considered in analysis	average change in ground water level during the year, in feet	Location and observed extremes of depth to ground water during 1958-59, in feet	
Name				Maximum	Minimum
Lower Mojave River Valley	6-40.00	4	0	9N/ 1E-21C1,S 94.6	9N/ 2E-30K1,S 9.3
Middle Mojave River Valley	6-41.00	3	+ 1	8N/ 6W-14Q1,S 255.3	10N/ 2W-36P1,S 13.5
Upper Mojave River Valley	6-42.00	16	- 1/2	5N/ 5W-22E1,S 322.3	3N/ 4W-28P2,S 2.4
El Mirage Valley	6-43.00	3	- 1	5N/ 7W- 9H1,S 283.4	6N/ 7W-12N1,S 20.6
Antelope Valley	6-44.00				
Neenach Basin	6-44.01	11	- 2	9N/16W-36A1,S 257.5	8N/16W-26G1,S 6.3
Willow Springs Basin	6-44.02	5	- 2 1/2	11N/13W-29M1,S 342.2	9N/13W- 7Q1,S 20.6
Chaffee Basin	6-44.04	1	0	11N/11W- 8D1,S 199.0	11N/12W-26J1,S 156.1
Lancaster Basin	6-44.05	75	- 6	6N/12W-24C1,S 310.8	5N/12W- 2K1,S 1.0
Buttes Basin	6-44.06	1	- 1	6N/10W-20P1,S 231.9	5N/12W-12A2,S 8.7
Rock Creek Basin	6-44.07	16	- 4	5N/ 9W-34D1,S 425.2	4N/ 9W- 6Q1,S 5.1

ESTIMATED AVERAGE CHANGES IN GROUND WATER LEVEL ELEVATIONS IN SELECTED VALLEYS AND BASINS IN LAHONTAN REGION (NO. 6) DURING 1958-59
(continued)

Ground water basin Name	Areal designation code	Number of wells considered in analysis	Estimated average change in ground water level during the year, in feet	Location and observed extremes of depth to ground water during 1958-59, in feet: Maximum	Minimum
Antelope Valley (continued)					
North Muroc Basin	6-44.08	5	- 1/2	11N/ 9W-17N1,S 131.2	10N/ 9W-24A2,S 72.6
Fremont Valley	6-46.00	5	- 2	32S/37E-11N1,M 281.9	30S/38E-32E1,M 40.1
Harper Valley	6-47.00	10	+ 1/2	10N/ 5W- 3J1,S 225.8	11N/ 3W-30A1,S Flowing
Superior Valley	6-49.00	3	0	31S/45E- 1C1,M 117.5	31S/46E-12P1,M 84.7
Cuddeback Valley	6-50.00	3	0	30S/42E-24L1,M 147.6	30S/42E-10L1,M 71.6
Indian Wells Valley	6-54.00	2	+ 1	26S/39E-20Q1,M 217.1	26S/40E-28J1,M 102.4

located in the Coachella Valley southeast of the town of Coachella, to more than 500 feet below the ground surface in a well situated about five miles northeast of Palm Springs.

All available ground water level data for the Colorado River Basin Region for the period July 1958 through June 1959 are tabulated in Volume 3, Appendix D, and summarized by ground water basin in Table 19. The historical change of ground water levels for well 10S/6E-21A1S, located in Borrego Valley, is represented by a hydrograph on Plate 12B. The location of this well is shown on Plate 9.

Santa Ana Region (No. 8)

Ground water level elevations in the Santa Ana Region followed the general pattern of adjacent Region 4 in that there were some very substantial rises in ground water levels in smaller basins adjacent to the mountains, particularly Lytle Creek Basin, and some general decreases in ground water levels in the larger basins located in downstream areas. As indicated previously, the increases were primarily attributed to the carry-over effects from the wet season of 1957-58, although in some areas artificial recharge activities contributed to the rises in ground water levels.

Available ground water level measurements for the Santa Ana Region, for the period July 1958 through June 1959, are tabulated in Volume III, Appendix E, and the estimated average change in ground water level elevations for selected ground water basins is presented in Table 20. Hydrographs of wells, which indicate long-term water level fluctuations in the region, are delineated on Plate 12B, and the locations of these wells are shown on Plate 10.

TABLE 19

ESTIMATED AVERAGE CHANGES IN GROUND WATER LEVEL ELEVATIONS IN SELECTED VALLEYS AND BASINS IN COLORADO RIVER BASIN REGION (NO. 7) DURING 1958-59

Ground water basin	Areal designation code	Number of wells considered in analysis	Estimated average change in ground water level during the year, in feet	Location and observed extremes of depth to ground water during 1958-59, in feet	
Name				Maximum	Minimum
Lanfair Valley	7- 1.00	6	- 3 1/2	12N/17E-17J1,S 414.1	14N/16E-22M1,S 24.0
Fenner Valley	7- 2.00	3	- 5 1/2	7N/15E-35R1,S 351.2	6N/16E- 6K1,S 258.2
Chuckawalla Valley	7- 5.00	3	- 2 1/2	5S/15E-29F1,S 389.0	5S/16E- 5B1,S 72.0
Bristol Valley	7- 8.00	2	- 2	5N/14E-15L1,S 213.5	5N/12E- 5B1,S 36.4
Dale Valley	7- 9.00	9	- 2	1N/10E-22J1,S 304.6	1N/12E-21L1,S 10.0
Twentynine Palms Valley	7-10.00	39	- 1/2	2N/ 8E-32K1,S 344.1	2N/ 9E-31J1,S 0.4
Copper Mountain Valley	7-11.00	10	- 1	1N/ 7E-30P1,S 368.6	1N/ 7E-26N1,S 169.1
Warren Valley	7-12.00	4	- 3 1/2	1N/ 5E-34K1,S 265.4	1S/ 5E- 4R2,S 58.3

ESTIMATED AVERAGE CHANGES IN GROUND WATER LEVEL ELEVATIONS IN SELECTED VALLEYS AND BASINS IN COLORADO RIVER BASIN REGION (NO. 7) DURING 1958-59
(continued)

Ground water basin Name	Areal designation code	Number of wells considered in analysis	Estimated average change in ground water level during the year, in feet	Location and observed extremes of depth to ground water during 1958-59, in feet: Maximum	Minimum
Deadman Valley	7-13.00	3	- 1/2	1N/ 6E- 4Q1,S 460.5	1N/ 6E- 9Q2,S 263.0
Johnson Valley	7-18.00	2	- 1/2	4N/ 3E-24Q1,S 55.0	4N/ 4E-19C1,S 44.9
Lucerne Valley	7-19.00	17	+ 1/2	6N/ 1E-31Q1,S 231.5	4N/ 1W-14B1,S 0.2
Morongo Valley	7-20.00	7	- 3 1/2	1S/ 4E-14N1,S 192.0	1S/ 4E-33C1,S 4.6
Coachella Valley	7-21.00	22	+ 1/2	3S/ 4E-30C1,S 532.0	6S/ 8E-11N1,S Flowing
Borrego Valley	7-24.00	8	- 1 1/2	10S/ 6E- 8B1,S 278.3	11S/ 6E-11M1,S 20.6
Ocotillo Valley	7-25.00	1	- 4	12S/ 8E-22E1,S 105.9	12S/ 8E-22E1,S 105.6

In the Santa Ana Forebay ground water basin of Coastal Orange County, approximately 80,000 acre-feet of imported Colorado River water was purchased and spread for ground water replenishment. As a result of this activity, the average ground water level in this basin declined only about one foot between the spring of 1958 and the spring of 1959. Without this activity, a substantially greater decline would have been observed. The maximum observed depth to ground water was 335 feet at a well located about two miles northeast of Orange, while a minimum depth to water of about 12 feet below the ground surface was observed at a well about one-half mile north of Olive.

Ground water pressure levels in the East Coastal Plain Pressure Area of Orange County dropped an average of seven feet between the spring of 1958 and the spring of 1959. The ground water pressure levels were below sea level throughout most of the basin, reaching a maximum of about 45 feet below sea level near the Orange County-Los Angeles County Line. The existence of a landward gradient in the pressure surface provides conditions favorable for the intrusion of sea water, and as discussed in Chapter IV it appears that intrusion is continuing, particularly in the Santa Ana Gap.

Ground water level elevations rose in a number of the smaller peripheral basins located adjacent to the mountains which surround the Upper Santa Ana Valley, particularly those near the San Gabriel Mountains and, in some instances, these rises were substantial. For example, in Lytle Basin ground water levels rose an average of 72 feet between the spring of 1958 and the spring of 1959, while in Claremont Heights and Cucamonga Basins average rises of 62 and 55 feet, respectively, were noted. These rises are similar to a condition observed in the Los

TABLE 20

ESTIMATED AVERAGE CHANGES IN GROUND WATER LEVEL ELEVATIONS IN SELECTED VALLEYS AND BASINS IN SANTA ANA REGION (NO. 8) DURING 1958-59

Ground water basin: Name	Areal designation code	Number of wells considered in analysis	Estimated average change in ground water level during the year, in feet	Location and observed extremes of depth to ground water during 1958-59, in feet: Maximum	Minimum
Coastal Plain (Orange County)	8-1.00				
East Coastal Plain Pressure Area	8-1.01	142	- 7	5S/ 9W-31J1,S 162.0	6S/10W-20M1,S 3.9
Santa Ana Forebay Area	8-1.02	73	- 1	4S/ 9W-22R1,S 335.4	4S/ 9W- 8C1,S 12.5
Irvine Basin	8-1.03	25	- 7 1/2	6S/ 8W- 5E1,S 278.5	5S/ 9W-15R3,S 47.5
La Habra Basin	8-1.04	7	- 3 1/2	3S/11W- 2N2,S 227.1	3S/10W-10N1,S 22.2
Yorba Linda Basin	8-1.05	4	+ 1/2	3S/ 9W-23K1,S 190.7	3S/ 9W-34C1,S 14.7
Santa Ana Narrows Basin	8-1.06	76	- 1 1/2	4S/ 9W- 3M1,S 62.9	3S/ 7W-21L1,S 3.6
Upper Santa Ana Valley	8-2.00				
Chino Basin	8-2.01	153	- 3	1S/ 8W-12H1,S 574.0	2S/ 8W-36Q1,S Flowing
Claremont Heights Basin	8-2.02	14	+62	1N/ 8W-35J2,S 394.0	1S/ 8W- 2M3,S 29.4
Cucamonga Basin	8-2.03	14	+55	1N/ 7W-29R4,S 492.3	1N/ 7W- 9D1,S 142.8

ESTIMATED AVERAGE CHANGES IN GROUND WATER LEVEL ELEVATIONS IN SELECTED VALLEYS AND BASINS IN SANTA ANA REGION (NO. 8) DURING 1958-59 (continued)

Ground water basin Name	Areal designation code	Number of wells considered in analysis	Estimated average change in ground water level during the year, in feet	Location and observed extremes of depth to ground water during 1958-59, in feet: Maximum	Minimum
Upper Santa Ana Valley (continued)					
Rialto Basin	8-2.04	12	+14	1N/ 5W-29A1,S 495.6	2N/ 6W-26L1,S 14.9
Colton Basin	8-2.05	29	- 6	1S/ 5W- 5A2,S 322.9	1S/ 4W-22B6,S 19.0
Bunker Hill Basin	8-2.06	167	- 2 1/2	1N/ 3W-28P1,S 433.2	1S/ 4W-22H4,S Flowing
Lytle Basin	8-2.07	14	+72	1N/ 5W-15K1,S 358.6	1N/ 5W-23P4,S 73.0
Lower Cajon Basin	8-2.09	1	-15 1/2	2S/ 8W-16C1,S 68.2	2S/ 8W-16C1,S 66.4
Devil Canyon Basin	8-2.10	5	+14 1/2	1N/ 4W-16E1,S 220.6	1N/ 4W-14R8,S 13.7
Beaumont Basin	8-2.12	16	+ 5 1/2	2S/ 1W-34Q1,S 391.0	2S/ 1W- 1E2,S Flowing
San Timoteo Basin	8-2.13	12	+ 7 1/2	1S/ 3W-24R1,S 328.1	2S/ 2W-20K1,S 34.5
Reche Canyon Basin	8-2.14	1	- 1/2	1S/ 3W-32G3,S 141.2	1S/ 3W-32G3,S 141.2
Riverside Basin	8-2.15	62	- 3	1S/ 5W-23N1,S 204.1	2S/ 5W-20A2,S 6.5
Arlington Basin	8-2.16	7	- 2	3S/ 5W-17Q1,S 72.1	2S/ 5W-31N1,S 7.1

ESTIMATED AVERAGE CHANGES IN GROUND WATER LEVEL ELEVATIONS IN SELECTED VALLEYS AND BASINS IN SANTA ANA REGION (NO. 8) DURING 1958-59
(continued)

Ground water basin	Areal designation code	Number of wells considered in analysis	Estimated average change in ground water level during the year, in feet	Location and observed extremes of depth to ground water during 1958-59, in feet	
Name				Maximum	Minimum
Upper Santa Ana Valley (continued)					
Temescal Basin	8-2.17	35	- 3 1/2	4S/ 7W- 3F1,S 184.8	3S/ 7W-20H1,S 2.3
Bedford Basin	8-2.18	4	- 2 1/2	4S/ 6W-35G2,S 72.9	4S/ 6W-16F1,S 28.6
Coldwater Basin	8-2.19	7	+26	5S/ 6W- 3Q1,S 190.0	5S/ 6W- 3G1,S 95.2
Lee Lake Basin	8-2.20	3	+ 2	5S/ 5W- 8P1,S 60.5	5S/ 5W- 7C1,S 6.6
Elsinore Valley	8-4.00	50	+ 6 1/2	5S/ 5W-34Q2,S 359.2	5S/ 4W-31H1,S 3.9
San Jacinto Valley	8-5.00	44	- 5	5S/ 1E-20G3,S 375.7	4S/ 1W-18L1,S 6.8

Angeles Region, and are due primarily to percolation from the late spring and summer runoff of the 1957-58 season.

In the more heavily pumped ground water basins of the Upper Santa Ana Valley, such as Chino, Riverside, Bunker Hill and Colton, the ground water levels reflected the dry season, because the average ground water elevations declined on the order of two to six feet between the spring of 1958 and the spring of 1959. In the northwestern portion of the Chino Basin, between the cities of Claremont and Upland, ground water levels were more than 570 feet below the ground surface, while at the southwesterly edge of the basin, in the vicinity of Prado Dam, rising water was observed. In Bunker Hill Basin, observed depths to ground water ranged from 430 feet below the ground surface at a point about one mile east of Patton, to flowing near Colton.

Ground water levels in the San Jacinto Valley declined an average of five feet between the spring of 1958 and the spring of 1959. However, the fluctuations of water levels in individual wells varied over a wide range. For example, a rise of 23 feet was noted at a well located about one mile south of San Jacinto, while a decline of 21 feet was observed at a well located about six miles south of Romoland. A hydrograph for well No. 4S/1W-35Q1 in the San Jacinto Valley, depicting the historical changes in ground water elevations, is presented on Plate 12B. The maximum and minimum observed depths from the ground surface to ground water in the San Jacinto Valley were 312 and 7 feet, respectively.

San Diego Region (No. 9)

A comparison of ground water levels observed in the spring of 1958 and the spring of 1959 in this Region indicates that there were more ground water basins with average increases than with average decreases. In the cases where average increases were observed, a detailed review of the data indicates that in most instances the rise occurred during the period April through June 1958, and that subsequent to that period water levels were in a general decline. Thus, it appears that the rises are actually a reflection of the wet year 1957-58, and that there was sufficient carry-over storage from the wet year to provide some supply for the succeeding year. This is particularly important in San Diego County where ground water basins are small and carry-over storage is limited.

Observed ground water elevations were below sea level at a number of wells in Mission Basin of the San Luis Rey River Valley and in the Tia Juana Basin. Thus, conditions that permit sea-water intrusion prevail. Ground water supply conditions in the vicinity of the City of San Clemente became critical during the 1958-59 water year as sea-water intrusion has become a very real threat to the wells of this city. It was necessary to closely control extractions from these wells to prevent chloride ion concentrations from increasing to the point where the pumped water would not be potable.

Available ground water level measurements for the San Diego Region for the period July 1958 through June 1959 are tabulated in Volume III, Appendix F, and pertinent statistics regarding ground water conditions are summarized in Table 21. Hydrographs of ground water levels at selected wells in Region 9 are presented on Plate 12B and the locations of these wells are shown on Plate 11.

TABLE 21

ESTIMATED AVERAGE CHANGES IN GROUND WATER LEVEL ELEVATIONS IN SELECTED VALLEYS AND BASINS IN SAN DIEGO REGION (NO. 9) DURING 1958-59

Ground water basin Name	Areal designation code	Number of wells considered in analysis	Estimated average change in ground water level during the year, in feet	Location and observed extremes of depth to ground water during 1958-59, in feet: Maximum	Minimum
San Juan Valley	9-1.00				
Aliso Creek Basin	9-1.01	3	+ 3	6S/ 8W-26F4,S 71.1	6S/ 8W-23R1,S 10.1
San Juan Creek Basin	9-1.02	54	- 1	8S/ 7W- 5C1,S 124.7	7S/ 8W-36P1,S 3.5
Temecula Valley	9-5.00				
Murrieta Basin	9-5.01	15	+ 1/2	6S/ 4W-27M1,S 141.5	8S/ 3W-13K1,S 14.2
Pauba Basin	9-5.02	3	- 2 1/2	8S/ 2W-12H1,S 66.5	8S/ 2W-11L1,S 31.1
Wolf Basin (Pechanga)	9-5.03	1	0	8S/ 2W-20E1,S 18.0	8S/ 2W-20E1,S 17.3
San Luis Rey Valley	9-7.00				
Mission Basin	9-7.01	11	+ 1	11S/ 4W-18C4,S 76.9	11S/ 5W-13N2,S 20.9
Bonsall Basin	9-7.02	38	+ 9	10S/ 3W-16E5,S 86.0	10S/ 2W- 6F1,S 7.8
Warner Valley	9-8.00	33	+33	10S/ 2E-24Q1,S 231.0	10S/ 3E-17P2,S Flowing

ESTIMATED AVERAGE CHANGES IN GROUND WATER LEVEL ELEVATIONS IN SELECTED VALLEYS AND BASINS IN SAN DIEGO REGION (NO. 9) DURING 1958-59
(continued)

Ground water basin Name	Areal designation code	Number of wells considered in analysis	Estimated average change in ground water level during the year, in feet	Location and observed extremes of depth to ground water during 1958-59, in feet: Maximum	Minimum
San Pasqual Valley	9-10.00				
Lake Hodges Basin	9-10.01	4	0	13S/ 2W- 2Q1,S 69.0	13S/ 2W- 2C2,S 11.1
San Pasqual Basin	9-10.02	57	+ 1 1/2	12S/ 1W-30A5,S 52.6	13S/ 2W-12L1,S 2.9
Felicita Basin	9-10.03	14	+ 1 1/2	13S/ 2W- 3E1,S 47.3	12S/ 2W-24R1,S 0.5
Green Basin	9-10.04	1	-13	13S/ 1W-31K1,S 44.9	13S/ 2W-26H2,S 33.0
Highland Basin	9-10.05	1	-31	13S/ 1W- 5L1,S 35.2	13S/ 1W- 5N1,S 10.0
Santa Ysabel Basin	9-10.08	1	- 6	12S/ 3E-16C2,S 13.0	12S/ 3E-21N1,S 3.0
Santa Maria Valley	9-11.00				
Ramona Basin	9-11.01	19	+ 1 1/2	12S/ 1E-34Q1,S 62.8	13S/ 1W-24K1,S 4.5
Santa Teresa Basin	9-11.05	1	+ 1/2	13S/ 2E- 3E1,S 15.5	13S/ 2E- 3E1,S 13.0
Ballena Basin	9-11.06	1	- 5 1/2	13S/ 2E-10K1,S 14.8	13S/ 2E-11C1,S 12.9
San Dieguito Valley	9-12.00				
San Dieguito Basin	9-12.01	9	- 7 1/2	13S/ 3W-32J1,S 84.2	14S/ 4W-11J2,S 5.5

ESTIMATED AVERAGE CHANGES IN GROUND WATER LEVEL ELEVATIONS IN SELECTED VALLEYS AND BASINS IN SAN DIEGO REGION (NO. 9) DURING 1958-59
(continued)

Ground water basin Name	Areal designation code	Number of wells considered in analysis	Estimated average change in ground water level during the year, in feet	Location and observed extremes of depth to ground water during 1958-59, in feet: Maximum	Minimum
San Diego River Valley	9-15.00	13	0	15S/ 1E-17H7,S 62.2	15S/ 1E-20B4,S 10.0
Sweetwater Valley	9-17.00	26	+3	17S/ 2W-25P4,S 24.0	17S/ 1W-30E1,S 3.6
Tia Juana Valley	9-19.00	51	- 1/2	18S/ 2W-27R2,S 82.4	18S/ 2W-32J5,S 4.7

CHAPTER IV QUALITY OF WATER AND SEA-WATER INTRUSION

There were some instances of localized deterioration noted during the 1958-59 season, primarily as the result of the disposal of sewage and industrial waste. However, the principal water quality problem in Southern California continued to be the intrusion of sea water in coastal ground water basins. During the 1958-59 season, the saline fronts advanced in all areas under surveillance.

The following sections present summary information on quality of surface and ground waters, and on the current status of sea-water intrusion.

Water Quality

Results of mineral analyses of surface and underground waters vary considerably within the various basins, making detailed evaluations of changes from year to year difficult and lengthy. Summary evaluations of water quality changes are presented in the Bulletin No. 65 series of the Department of Water Resources, entitled "Quality of Surface Waters of California", and the Bulletin No. 66 series of Department of Water Resources, entitled "Quality of Ground Waters in California". Bulletins in these series for the year 1959 are currently being prepared. For the purpose of this Bulletin, mineral analyses of water samples collected during 1958-59 at selected surface and underground points in some of the basins in Southern California were compiled. These analyses are presented in Tables 22 and 23. The analyses shown are intended only to give a general indication of water quality at the various locations and are not necessarily representative of the average conditions in a stream or of a ground water basin.

TABLE 22

MINERAL ANALYSES OF SURFACE WATER AT
SELECTED STATIONS IN SOUTHERN CALIFORNIA

Station number	Station	Date sampled and estimated discharge	$ECx10^6$ at 25°C	Mineral constituents, in parts per million								Total hardness as $CaCO_3$, in ppm	Per-cent Na
				Ca	Mg	Na+K	HCO_3	SO_4	Cl	NO_3	B		
37-121.7	Salinas River, USGS gage at old State Highway 41 bridge at Paso Robles	4-9-59 0.6 cfs	1,060	76	35	104	339	138	96	4.6	0.30	333	40
318-35.5	Santa Ynez River at Mission Bridge, 0.9 mile S. of Solvang	5-6-59 9.1 cfs	1,032	91	61	56	364	241	40	0	0.30	479	20
42-5.7	Ventura River, N. of Ventura, in Foster Memorial Park, 300 feet down-stream from highway bridge, at USGS gaging station	5-4-59 0.5 cfs	1,002	118	36	56	271	261	48	2.0	0.52	443	21
43-17.0	Santa Clara River, E. of Santa Paula and about 1.5 miles upstream from Willard Bridge	5-4-59 75 cfs	2,215	219	91	194	339	883	90	12	1.06	920	30

MINERAL ANALYSES OF SURFACE WATER AT
SELECTED STATIONS IN SOUTHERN CALIFORNIA
(continued)

Station number	Station	Date sampled and estimated discharge	$EC \times 10^6$ at 25°C	Mineral constituents, in parts per million									Total hardness as $CaCO_3$, in ppm	Per-cent Na
				Ca	Mg	Na+K	HCO_3	SO_4	Cl	NO_3	B			
47-23.9	Los Angeles River, NE. of Los Angeles at Figueroa Street	5-20-59 1.0 cfs	1,816	92	51	224	205	404	249	2.6	0.68		441	52
47-12.2-9.6	Rio Hondo, N.E. of Montebello, about 0.1 mile upstream from San Gabriel Blvd. bridge	5-5-59 2.0 cfs	902	73	26	72	246	152	54	2.5	0.26		289	33
48-20.7	San Gabriel River, S.W. of El Monte and 0.5 mile up-stream from Whittier Narrows Dam	5-5-59 2.0 cfs	941	75	33	73	207	162	67	1.5	0.44		323	30
82-57.9-2.0	Warm Creek, San Bernardino at "E" Street	Station dry at all times visited during 1958-59 season												
82-45.2	Santa Ana River, Pedley Bridge N. of Arlington	5-5-59 5.0 cfs	986	85	36	79	310	96	100	18	0.12		361	30

MINERAL ANALYSES OF SURFACE WATER AT
SELECTED STATIONS IN SOUTHERN CALIFORNIA
(continued)

Station number	Station	Date sampled and estimated discharge	$EC \times 10^6$ at 25°C	Mineral constituents, in parts per million								Total hardness as $CaCO_3$ in ppm	Per-cent Na
				Ca	Mg	Na+K	HCO_3	SO_4	Cl	NO_3	B		
93-20.0	Santa Margarita River, N. of Fall-brook, about 0.5 mile downstream from confluence with Sandia Creek	5-4-59 0.5 cfs	1,143	74	34	131	334	108	148	0	0.17	325	46
94-28.0	San Luis Rey River, S.E. of Pala at Pala Diversion Dam	5-4-59 1/25 est.	673	62	22	55	156	152	45	0.00	0.00	247	30
620A-28.8	Big Rock Creek, S.E. Pearblossom and about 300 feet up-stream from con-fluence with Pallett Creek	2-25-59	407	50	15	12	211	28	4	0.00	0.01	186	10
619-95	Mojave River, N.W. of Victorville, about 0.2 mile S.E. of U. S. Highway 91 bridge	5-5-59 27 cfs	420	38	9	45	183	33	26	1.0	0.08	132	40

TABLE 23

MINERAL ANALYSES OF GROUND WATER AT SELECTED WELLS IN SOUTHERN CALIFORNIA

State well number	Owner and location	Date sampled	$ECx10^6$ at 25°C	Mineral constituents, in parts per million								Total hardness as $CaCO_3$ in ppm	Per-cent Na
				Ca	Mg	Na+K	HCO_3	SO_4	Cl	NO_3	B		
				Central Coastal Region									
Santa Maria River Valley													
10W/34W-19H1	1.0 mile N. of Betteravia Road on Black Road, just W. of Black Road	5-26-59	1,470	143	66	90	259	448	85	22	0.3	628	23
Lompoc Subarea, Santa Ynez River Valley													
7N/35W-26F4	Union Sugar Co. 300' N. of Central Ave. produced 100' W. of Union Sugar Ave.	12-11-59	1,996	160	100	120	351	372	262	6.5	0.24	816	22
				Los Angeles Region									
Oxnard Plain Pressure Area, Santa Clara River Valley													
1N/22W-3F4	City of Oxnard; 200' E. of Saviers Road, 100' N. of Third Street	12-10-59	1,500	177	50	105	293	518	58	17	0.7	647	25

MINERAL ANALYSES OF GROUND WATER AT
SELECTED WELLS IN SOUTHERN CALIFORNIA
(continued)

State well number	Owner and location	Date sampled	$EC \times 10^6$ at 25°C	Mineral constituents, in parts per million								Total hardness as $CaCO_3$ in ppm	Per-cent Na
				Ca	Mg	Na+K	HCO_3	SO_4	Cl	NO_3	B		
	Los Angeles Region (continued)												
Oxnard Plain Forebay Area, Santa Clara River Valley													
2N/22W-12G1	United Concrete Pipe Corporation; One mile S.E. of Saticoy, 200' N.E. of Del Norte Avenue, 500' S.E. of Vineyard Avenue	3-31-59	1,303	123	43	119	261	440	46	3	1.0	484	38
Central Coastal Plain Pressure Area, Coastal Plain (Los Angeles County)													
3S/12W-8F1	Los Angeles County Farm; Two miles S.W. of Downey, 1,600' S. and 300' W. of intersection of Imperial Hwy. and County Farm Road	9-1-59	471	43	10	47	204	26	18	6.4	0.13	148	39
Montebello Forebay Area, Coastal Plain (Los Angeles County)													
2S/11W-19L1	La Habra Heights Mutual Water Company, Judson No. 3 well; Two miles W. Whittier, 1,050' W. of Norwalk Blvd., 1,600' from Dunlap Crossing along road	6-24-59	818	98	22	43	198	161	64	12	0.06	335	20

MINERAL ANALYSES OF GROUND WATER AT
SELECTED WELLS IN SOUTHERN CALIFORNIA
(continued)

State well number	Owner and location	Date sampled	$EC \times 10^6$ at 25°C	Mineral constituents, in parts per million								Total hardness as $CaCO_3$ in ppm	Per-cent Na
				Ca	Mg	Na+K	HCO_3	SO_4	Cl	NO_3	B		
	Los Angeles Region, (continued)												
San Fernando Basin, San Fernando Valley													
1N/14W-14B1	City of Burbank; 35' N.E. of Lake St. 40' N.W. of Orange Grove Ave.	7-23-59	483	--	--	--	211	--	21	--	--	173	--
Main San Gabriel Basin, San Gabriel Valley													
1S/11W-2G2	City of Monrovia; three miles S. of Monrovia, 420' E. of Peck Rd., 110' N. of Jeffries Avenue	5-15-59	592	--	--	--	263	--	18	--	--	279	--
Pasadena Subarea, San Gabriel Valley													
1N/12W-20B1	City of Pasadena, Copelin Well; Pasadena, 142' E. of Mentone Avenue, 118' N. of Manzanita Street	6-1-59	--	59	19	22	210	58	28	11	--	223	17

MINERAL ANALYSES OF GROUND WATER AT
SELECTED WELLS IN SOUTHERN CALIFORNIA
(continued)

State well number	Owner and location	Date sampled	$EC \times 10^6$ at 25°C	Mineral constituents, in parts per million: Ca	Mg	Na+K	HCO_3	SO_4	Cl	NO_3	B	Total hardness as $CaCO_3$ in ppm	Per-cent Na
	Lahontan Region												
	Lancaster Basin, Antelope Valley												
8N/13W-32N1	Pedro Lizarraga; 100' E. of 90th Street W. and 100' N. of Avenue "G"	7-9-59	569	--	--	--	200	--	50	--	--	170	--
	Santa Ana Region												
	East Coastal Plain Pressure Area, Coastal Plain (Orange County)												
4S/11W-36N1	Mountain Properties, Inc.; Three miles W. of Garden Grove, 125' S. of Stanford Avenue, 258' E. of Sycamore Street	6-16-59	434	42	11	34	153	47	27	3	0.05	150	31
	Chino Basin, Upper Santa Ana Valley												
1S/7W-21D1	City of Ontario, No. 4 well; Two miles N.E. of Ontario, 90' S. of 4th St., 300' E. of Grove Avenue	7-8-59	556	58	13	42	168	97	31	8	0.0	198	30

MINERAL ANALYSES OF GROUND WATER AT
SELECTED WELLS IN SOUTHERN CALIFORNIA
(continued)

State well number	Owner and location	Date sampled	$EC \times 10^6$ at 25°C	Mineral constituents, in parts per million								Total hardness as $CaCO_3$ in ppm	Per-cent Na
				Ca	Mg	Na+K	HCO_3	SO_4	Cl	NO_3	B		
				Santa Ana Region (continued									
Bunker Hill Basin, Upper Santa Ana Valley													
1S/4W-15M2	Meeks and Daley Water Company; 0.7 mi. S. of Mill St., 100' W. of "E" St.	6-18-59	560	60	7	49	200	70	22	0	0	180	34
				San Diego Region									
Mission Basin, San Luis Rey River Valley													
11S/4W-18C1	2,900' N.E. from ppg. plt., along Hwy 76, 1,760' N.W. along private road, 15' S.W. of road	11-12-59	1,140	95	34	89	198	146	180	0.35	--	370	35
Tia Juana Valley													
19S/2W- 4A5	California Water and Telephone Company, Well No. 5; South Basin Plant. 720' W. of National Ave., 1,500' S. of Sunset Avenue	3-18-59	2,700	168	77	310	354	391	488	2.6	0.2	735	47

Sea-Water Intrusion

The movement of sea water into the fresh-water aquifers of coastal ground water basins of Southern California continued during 1958-59. The Oxnard Plain Pressure Area of Ventúra County, the West Coast Basin of Los Angeles County, and East Coastal Plain Pressure Area of Orange County are the major basins experiencing this problem. The status of sea-water intrusion within each of these basins is discussed in this section. A description of the location and hydrologic features of these basins, as well as the history of sea-water intrusion and the corrective measures undertaken, may be found in Bulletin No. 39-57, Volume I, of this series of reports. A detailed study of sea-water intrusion in California is reported in Department of Water Resources Bulletin No. 63, "Sea Water Intrusion in California".

In addition to those ground water basins indicated above, there are several smaller basins which are confronted by an imminent threat to ground water quality by sea-water intrusion. These include Morro and Chorro Basins in San Luis Obispo County, Malibu Creek Basin in Los Angeles County, San Mateo Basin near San Clemente in Orange County, and Mission Basin of the San Luis Rey River Valley, and the Tia Juana Basin in San Diego County. In all of these areas the ground water levels continued to slope inland from the ocean during 1958-59. The amount and nature of sea-water intrusion depended on the size of the ground water basin, the extent of ground water extractions, and the length of time the ground water levels have been below sea level. In certain of these smaller basins the water users have had to curtail pumping to forestall further damage to the limited water supplies. Nevertheless, this action has not been completely successful, and ground water table elevations below sea level are inducing an advance of the sea-water intrusion front toward inland wells, in most of these areas.

Oxnard Plain Pressure Area

Isochlors outlining areas of the Oxnard Plain Pressure Area, where mineral analyses of water from wells indicated that chloride ion concentrations exceeded 100 and 500 parts per million (ppm) during the spring of 1959, are presented on Plate 13. Ground water level contours for June 1959 are also shown on this plate. These data indicate that movement of sea water has been generally landward during the past year, and that intrusion continues in two areas, one centering around Port Hueneme and the other near Mugu Lagoon.

Near Port Hueneme, intrusion continued to advance inland in the area between Hueneme and Pleasant Valley Roads. The lines of 100 ppm and 500 ppm chlorides moved eastward as much as 800 feet during the past year, to form an apparent bulge in this area. It is noted that the ground water level contours indicate an eastward, landward gradient which accounts for the rapid advance of sea water in that direction. No other major changes in the sea-water intrusion front in the Port Hueneme area were detected during the past year, although some adjustments were made in the location of the isochlor lines from that shown for 1958 on the basis of more recent data on aquifer configuration. In summary, the area underlain by sea water increased considerably in lateral extent. However, the maximum landward advance of the 500 ppm isochlor line remains at about 1.8 miles easterly of the coast.

Fluctuations of the chloride content in ground water from well 1N/22W-28A2, located near Port Hueneme, for the period 1956 through 1959, are presented graphically on Plate 14.

In the vicinity of Mugu Lagoon, and especially in the Naval Reservation area, the absence of water wells prevents the acquisition of essential data, so the extent of intrusion cannot be accurately determined. Samples of water from two new wells drilled to the west of Arnold Road show the existence of good quality ground water considered to be native to the area, while earlier evidence had indicated the presence of higher chloride concentrations. As a result, the isochlor lines have been adjusted to reflect these more recent data. To the south and west of Hueneme and Arnold Roads, there exists an apparently isolated area of about 200 acres where wells produce ground waters with chloride content ranging up to 560 ppm. The source of these saline waters has not as yet been determined.

West Coast Basin

Sea water has intruded the fresh-water aquifers of West Coast Basin along the entire coast line bordering on Santa Monica Bay, from Palos Verdes Hills to Ballona Gap. Lines of equal chloride concentration of 250, 500, and 1,000 ppm for the spring of 1959 are delineated on Plate 15. Ground water level contours for June 1959 are also shown on this plate.

In the spring of 1959, the 500 ppm isochlor was located an average distance of 1.3 miles inland from the coast. The 250 ppm isochlor line was approximately 1,000 feet farther inland. Near the Cities of Manhattan Beach and El Segundo, both the 250 and 500 ppm chloride lines have advanced landward an average distance of 500 feet since the previous spring. The isolated body of injected fresh water landward of the West Coast Basin Barrier Project has advanced to the east an equivalent distance. Extension of this fresh-water mound northerly shows the influence of two new wells added to the north end of the line of injection wells in 1957. The isochlor lines along other portions of the sea-water intrusion front remain in the same positions for 1959 as in 1958. The landward hydraulic gradient of the pressure surface continues.

Fluctuations of the chloride content of water from well 3S/15W-21G1 in Manhattan Beach are shown for the period 1953 through 1959 on Plate 14.

East Coastal Plain Pressure Area

Lines of equal chloride ion concentrations of 50, 100, and 500 ppm for the East Coastal Plain Pressure Area for the spring of 1959 are delineated on Plate 16. Ground water level contours for the Talbert Zone in Santa Ana Gap and the upper zone under Bolsa Chica Mesa for June 1959 are also shown on this plate.

Sea water has intruded a sizable area of the Talbert water-bearing zone in Santa Ana Gap, and landward movement continued during the last year. The 500 ppm isochlor line has now advanced inland as far as three miles, and the chloride ion concentration in wells along the intrusion front continues to increase.

The upper water-bearing zone underlying Bolsa Chica Mesa is being slowly intruded by sea water and/or oil field brines. This advance is indicated by increases in chloride content in the ground water occurring as far as one-half mile to the landward side of the Newport-Inglewood fault zone. Available data show no evidence of intrusion in the deeper ground water-bearing zones in this area.

Fluctuations of the chloride content of water from well 6S/10W-6L2 in the Santa Ana Gap during the period 1951 through 1959 are shown on Plate 14.

CHAPTER V

CONSTRUCTION ACTIVITIES AFFECTING WATER SUPPLY CONDITIONS

Although not in themselves items of water supply, construction activities related to water directly affect water supply conditions in Southern California. For this reason, a brief outline of the important activities occurring during the 1958-59 season is presented below.

Construction of Dams

Two dams, Twitchell Dam on the Cuyama River and Casitas Dam on Coyote Creek, a tributary of the Ventura River, were completed during the period encompassed by this report, and four other projects were in various phases of construction on September 30, 1959. Table 24 lists the various dam projects with reservoir storage capacities over 100 acre-feet which were under construction during the 1958-59 water year, together with approximate dates of starting and completion and the agencies responsible for the work.

Colorado River Aqueduct

During 1958-59, The Metropolitan Water District of Southern California continued work on several of its projects. Construction was completed on the 47 siphons of the second barrel of the aqueduct east of San Jacinto Tunnel. Installation of pumping units seven and eight of the nine units at each plant was completed, and installation of the ninth and final unit was substantially advanced. Construction of the third pump discharge line from each of the pumping plants was also completed. Thus, with the exception of the ninth pumping unit, the aqueduct was completed to full capacity east of the San Jacinto Tunnel. Construction of features needed to complete the aqueduct between the San Jacinto Tunnel and Lake

TABLE 24

DAM PROJECTS* COMPLETED OR UNDER CONSTRUCTION
DURING THE WATER YEAR 1958-59

Dam Project	Construction period		Agency responsible for construction	Purpose	Location	Reservoir capacity, in acre-feet
	Started	Completed				
Whale Rock	3-59	Incomplete	DWR and City of San Luis Obispo	Conservation	Old Creek San Luis Obispo County	40,000
Twitchell (Vaquero)	6-56	7-59	U. S. Bureau of Reclamation	Conservation, Flood control, Recreation	Cuyama River Santa Barbara and San Luis Obispo Counties	240,000
Casitas	8-56	2-59	U. S. Bureau of Reclamation	Conservation, Flood control, Recreation	Coyote Creek Ventura County	250,000
Rattlesnake	8-59	Incomplete	Irvine Co.	Regulating Storage	Rattlesnake Creek Orange County	1,500
Lake Mathews (enlargement)	3-59	Incomplete	The Metropolitan Water District of Southern California	Terminal reservoir Colorado River Aqueduct	Cajalco Creek Riverside County	180,000
Box Springs	9-59	Incomplete	Riverside County Flood Control and Water Conservation District	Conservation, Flood control	Box Springs Creek Riverside County	387

* Greater than 100 acre-feet capacity

Mathews was under contract at the end of September 1959 and was scheduled for completion in early 1960.

A portion of the second San Diego Aqueduct is being constructed by The Metropolitan Water District of Southern California, with the balance being constructed by the San Diego County Water Authority. That portion being constructed by The Metropolitan Water District comprises 4.8 miles of canal, 0.2 mile of box siphons, and 18.6 miles of pipeline; and extends from the San Jacinto Tunnel to a point six miles south of the Riverside-San Diego County line. By October 1, 1959, the pipeline and siphon structures were completed, and canal construction was over 60 percent completed. The portion of the aqueduct being constructed by the San Diego County Water Authority totals some 59 miles in length and extends from the end of the line being constructed by The Metropolitan Water District to Lower Otay Reservoir. During the 1958-59 water year, construction was completed on the northerly section totaling 10.6 miles, and a second section totaling 18.5 miles was approaching completion. Construction on the last two sections totaling 16.8 miles and 13.4 miles, respectively, was initiated during this period. The aqueduct is scheduled for completion in late fall 1960.

The Metropolitan Water District continued construction work on portions of its main distribution system. Construction was finished on a 14.3-mile portion of the Lower Feeder between Santa Ana Canyon and the east boundary of Los Angeles County. This completed the 45.1-mile distribution line which extends from Lake Mathews to the City of South Gate, except for three pressure control structures to be located near Brea, La Habra, and at the San Gabriel River. Construction on these structures was started. Construction was started on the West Coast Feeder, which is 14.6 miles in length. It is scheduled for completion in late 1960.

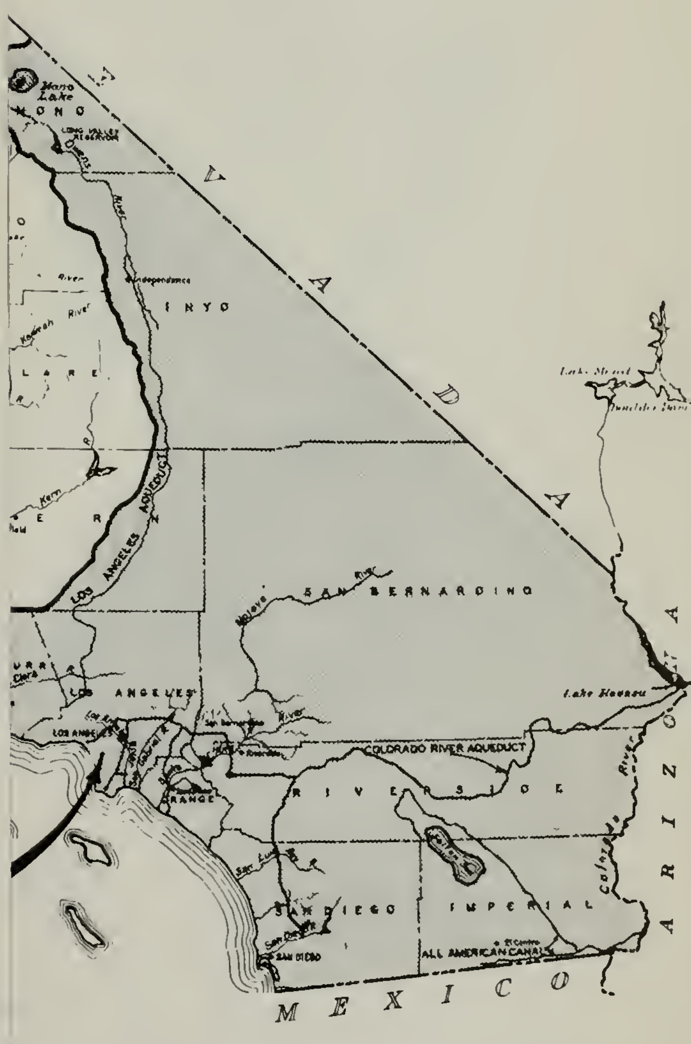
STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN CALIFORNIA DISTRICT

ATER SUPPLY CONDITIONS IN SOUTHERN
CALIFORNIA DURING 1958-59

LOCATION OF SOUTHERN CALIFORNIA DISTRICT

SCALE OF MILES
40 0 40 80

1961




STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN CALIFORNIA DISTRICT
WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59
LOCATION OF SOUTHERN CALIFORNIA DISTRICT
SCALE OF MILES
40 0 40 80
1961
OREGON
NEVADA
ARIZONA
MEXICO
PACIFIC OCEAN
SISKIYOU
MODOC
SHASTA
LASSEN
MONO
INYO
TULARE
KERN
SAN LUIS OBISPO
SANTA BARBARA
VENTURA
LOS ANGELES
SAN BERNARDINO
RIVERSIDE
ORANGE
SAN DIEGO
IMPERIAL
LOS ANGELES AQUEDUCT
COLORADO RIVER AQUEDUCT
ALL AMERICAN CANAL
SAN FRANCISCO
N
SOUTHERN CALIFORNIA DISTRICT

PLATE 2

LEGEND

MEAN SEASONAL PRECIPITATION FOR 50 YEAR PERIOD 1897-1947

- LESS THAN 10 INCHES
- 10 TO 20 INCHES
- 20 TO 30 INCHES
- MORE THAN 30 INCHES
- 20 — 50 YEAR MEAN ISOHYETAL LINES
- SOUTHERN CALIFORNIA DISTRICT BOUNDARY
- 80 — PRECIPITATION DURING 1958-59 IN PER CENT OF 50-YEAR MEAN PRECIPITATION

STATE OF CALIFORNIA

DEPARTMENT OF WATER RESOURCES

SOUTHERN CALIFORNIA DISTRICT

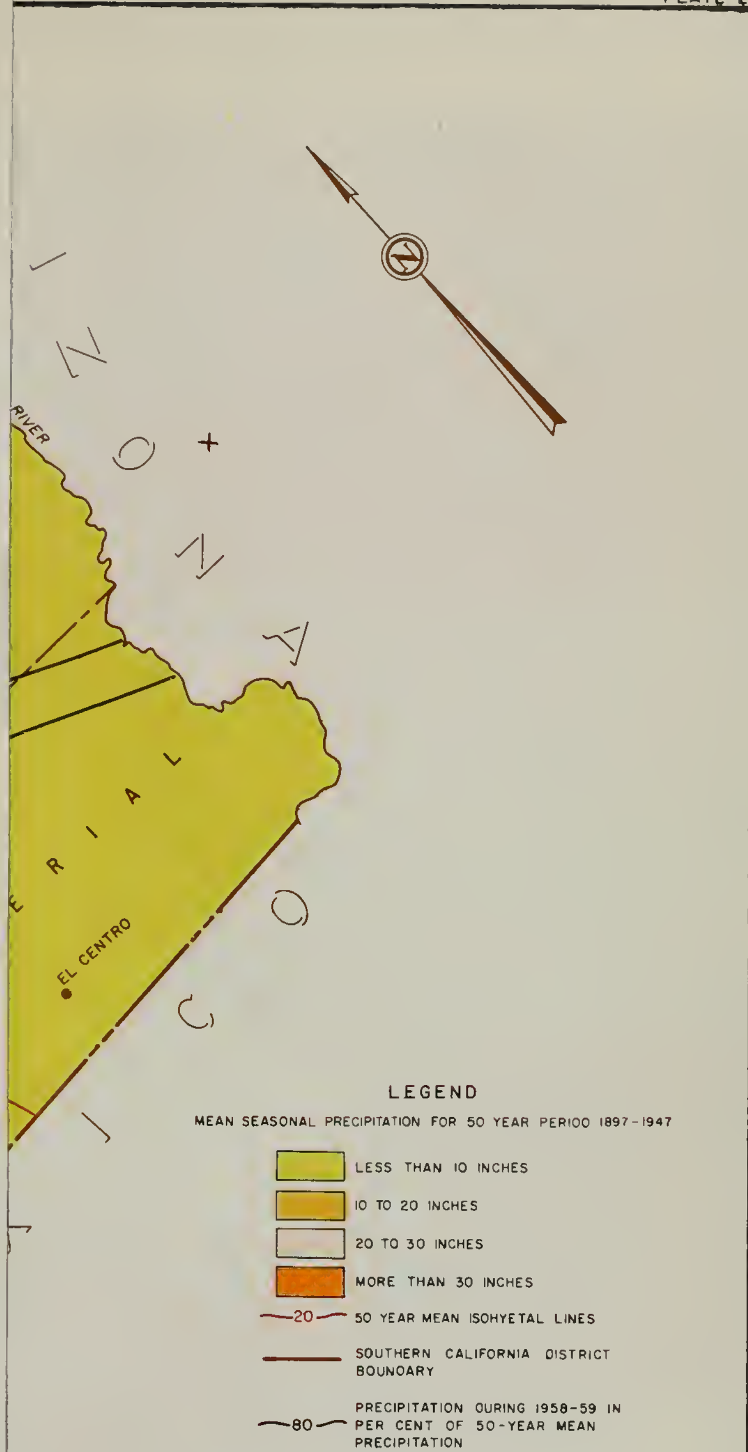
WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59

PRECIPITATION DURING 1958-59 IN PER CENT OF 50-YEAR MEAN PRECIPITATION

SCALE OF MILES

20 10 0 20 40

1961



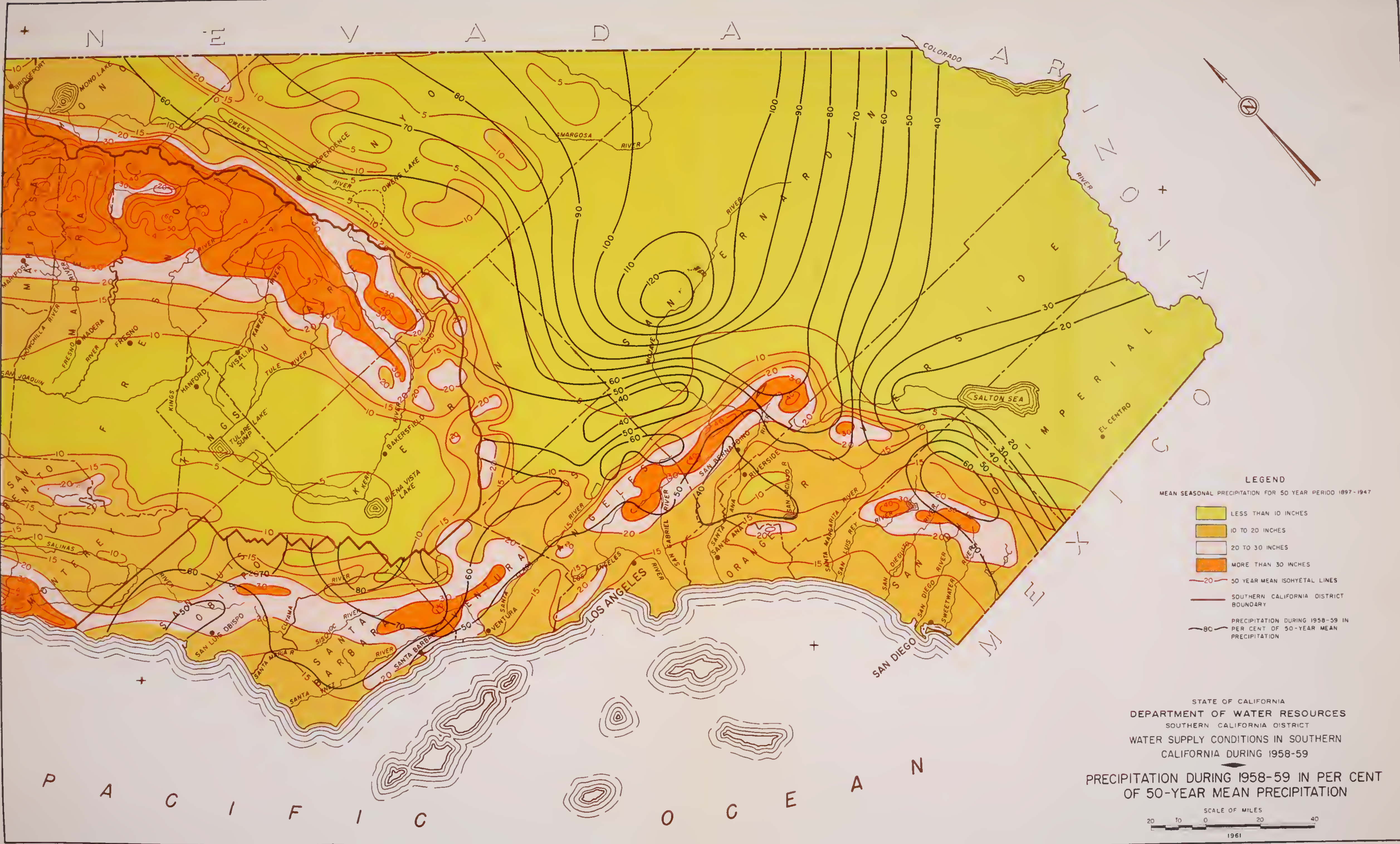
STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN CALIFORNIA DISTRICT

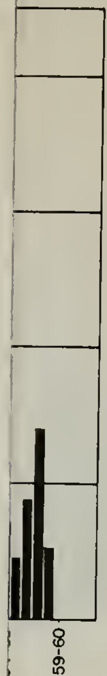
WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59

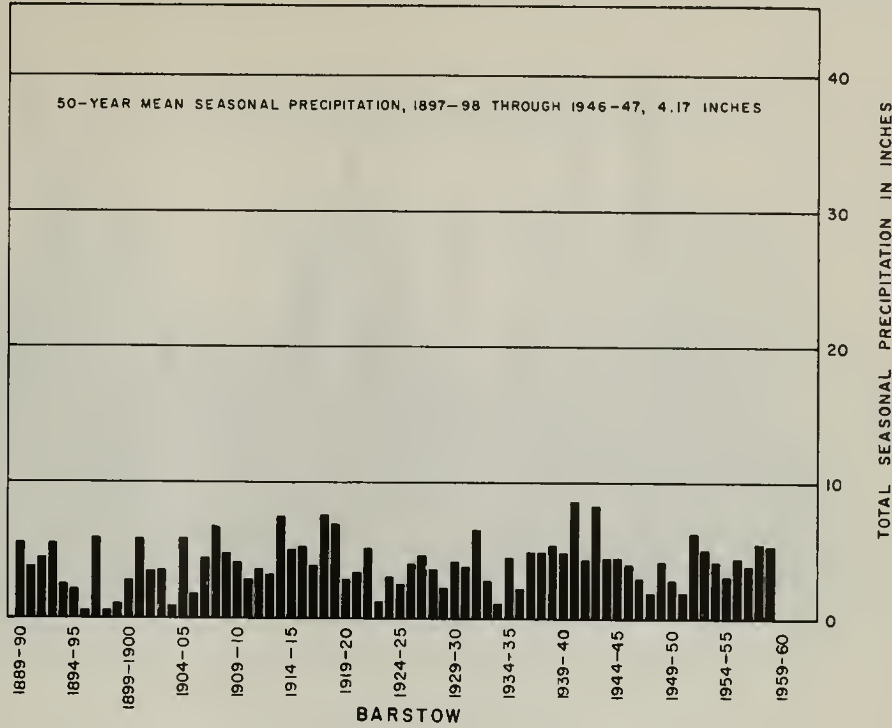
PRECIPITATION DURING 1958-59 IN PER CENT OF 50-YEAR MEAN PRECIPITATION

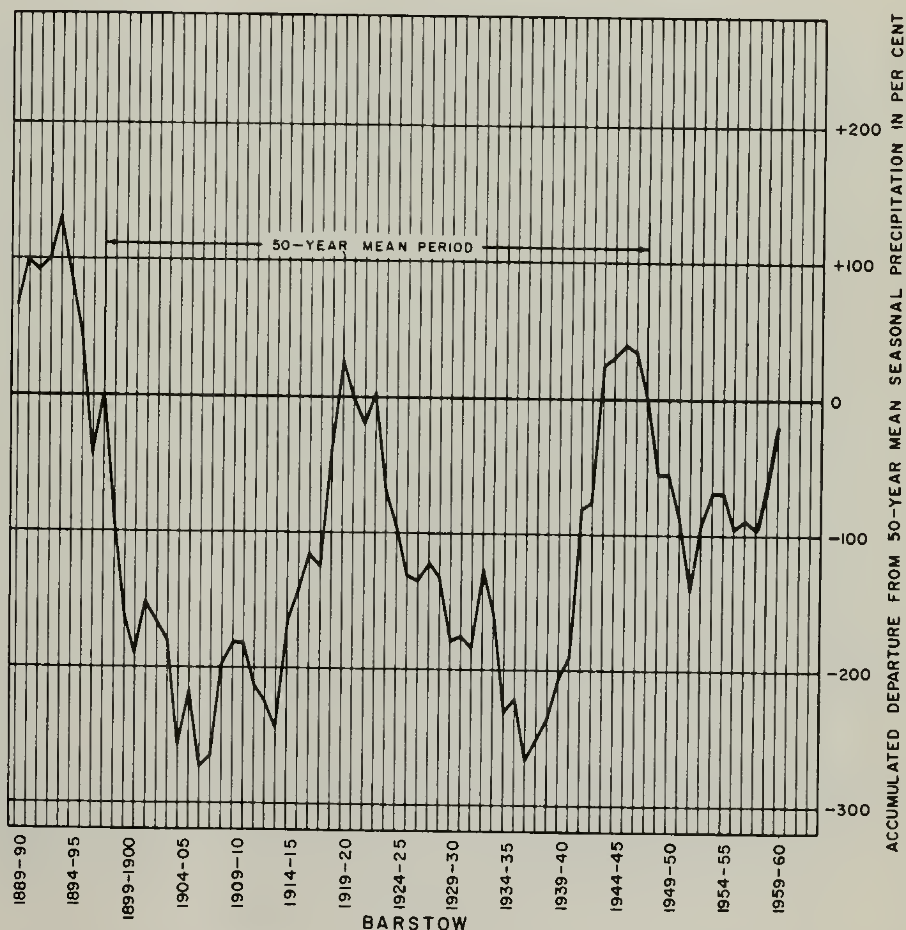
SCALE OF MILES
20 10 0 20 40

1961


NEVADA
ARIZONA
MEXICO
PACIFIC OCEAN
SAN BERNARDINO
IMPERIAL
RIVERSIDE
SAN DIEGO
ORANGE
LOS ANGELES
VENTURA
SANTA BARBARA
SAN LUIS OBISPO
KERN
KINGS
TULARE
FRESNO
MADERA
MARIPOSA
MONO
INYO
MONTEREY
SAN BENITO
SALTON SEA
COLORADO RIVER
LEGEND
MEAN SEASONAL PRECIPITATION FOR 50 YEAR PERIOD 1897 - 1947
LESS THAN 10 INCHES
10 TO 20 INCHES
20 TO 30 INCHES
MORE THAN 30 INCHES
50 YEAR MEAN ISOHYETAL LINES
SOUTHERN CALIFORNIA DISTRICT BOUNDARY
PRECIPITATION DURING 1958-59 IN PER CENT OF 50-YEAR MEAN PRECIPITATION
STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN CALIFORNIA DISTRICT
WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59
PRECIPITATION DURING 1958-59 IN PER CENT OF 50-YEAR MEAN PRECIPITATION
SCALE OF MILES
1961

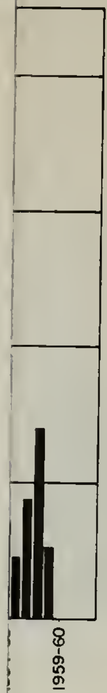


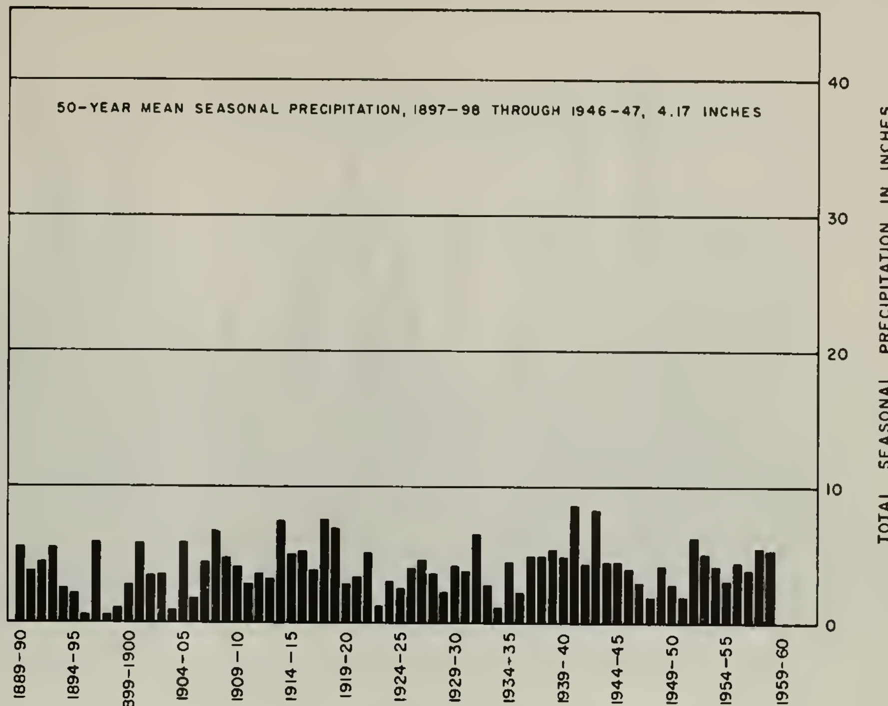




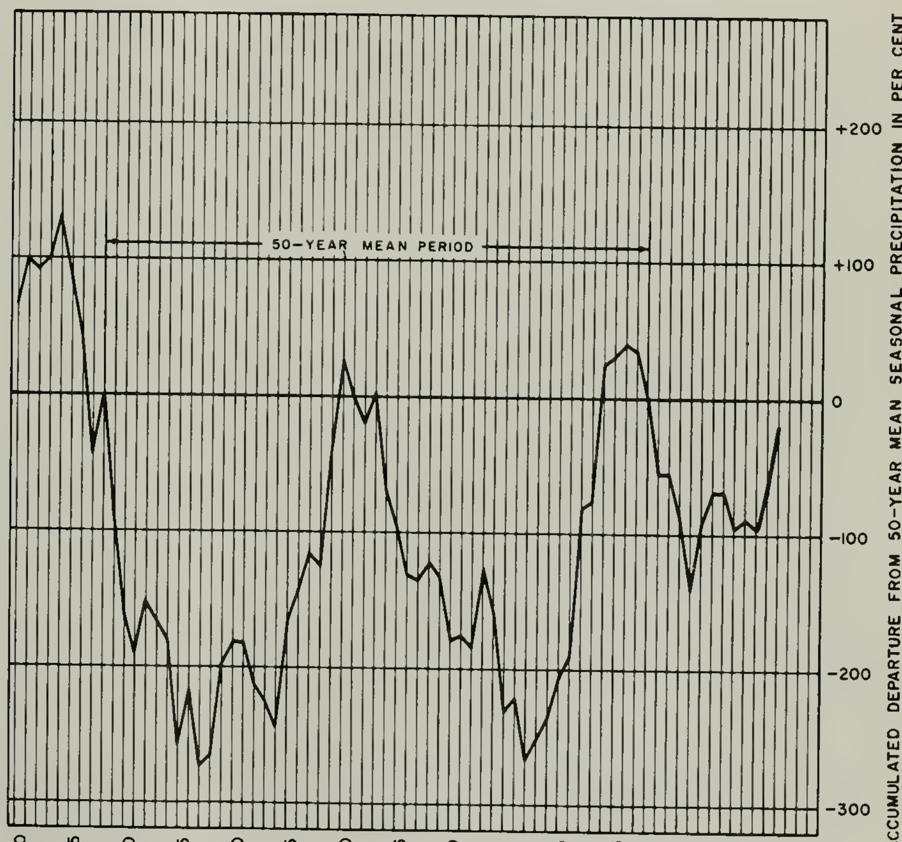
T I O N

R N   C A L I F O R N I A





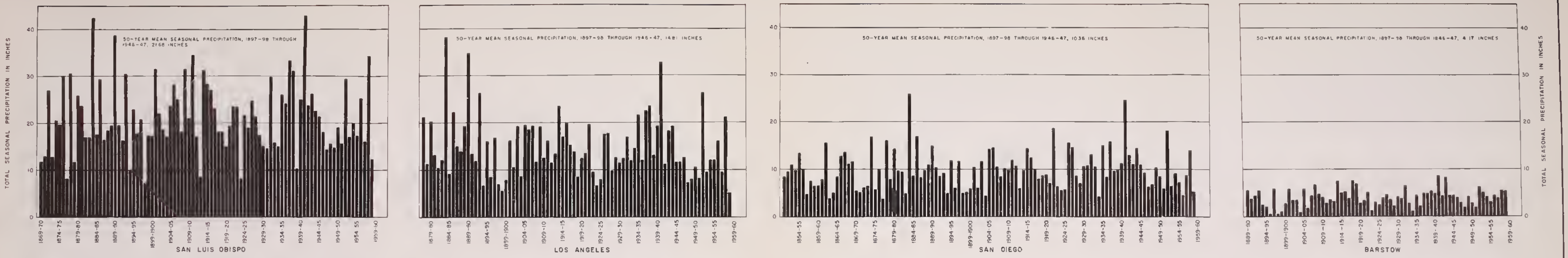
BARSTOW



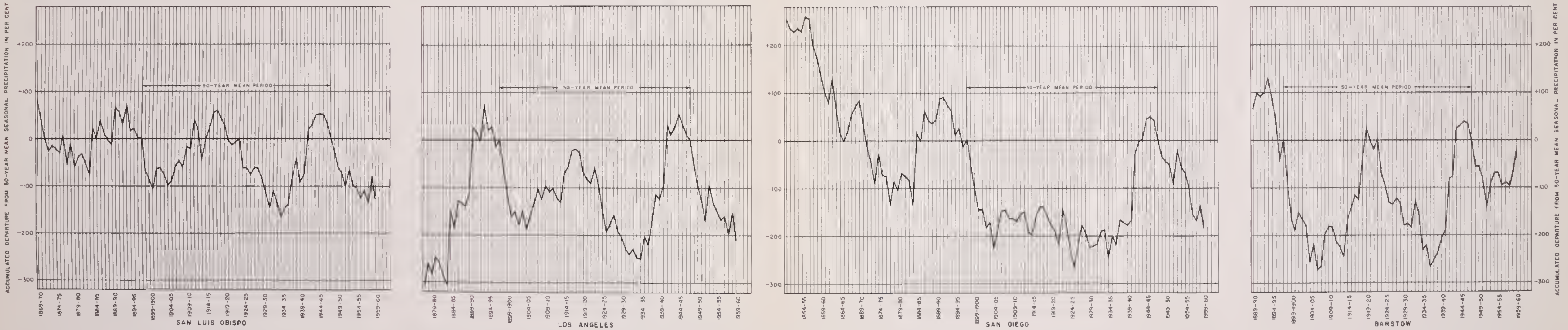
BARSTOW

T I O N

R N   C A L I F O R N I A



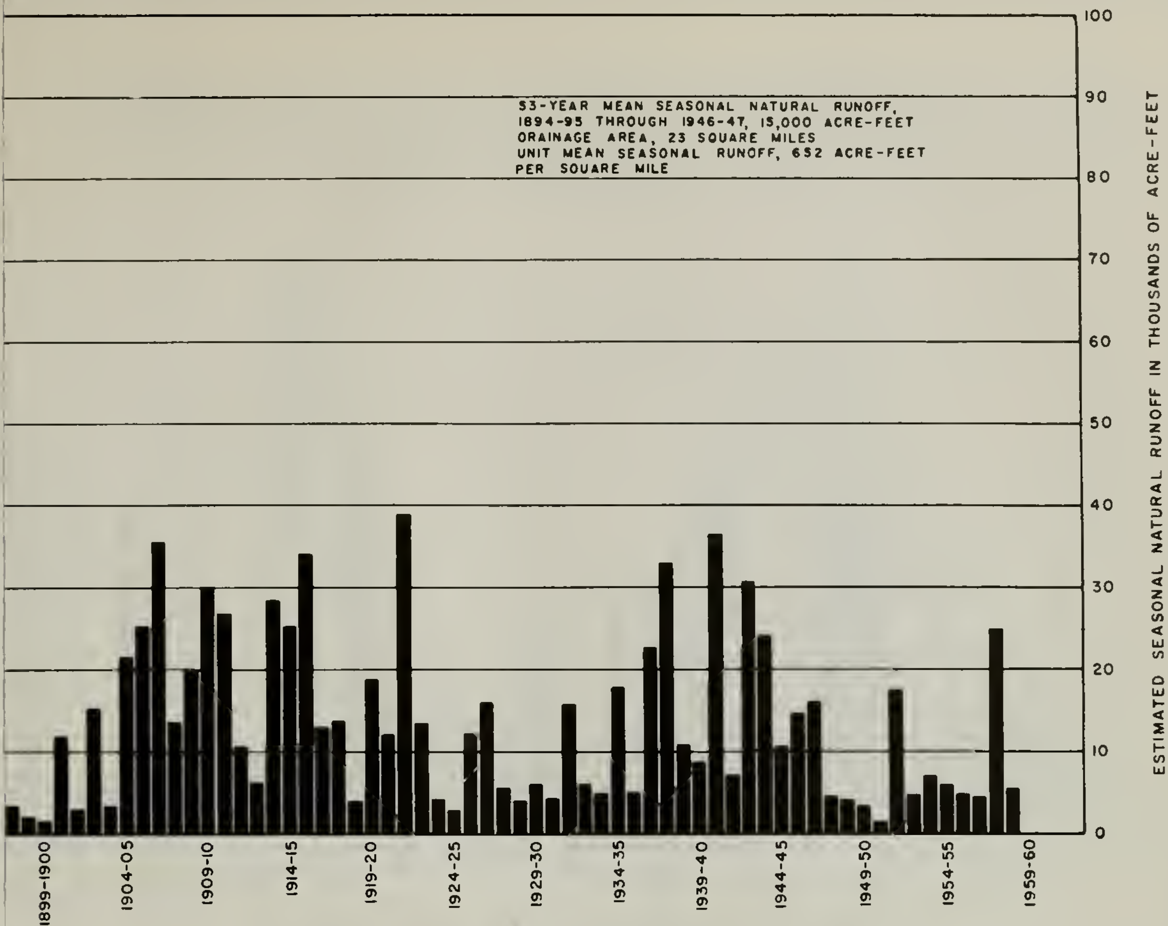
SEASONAL PRECIPITATION



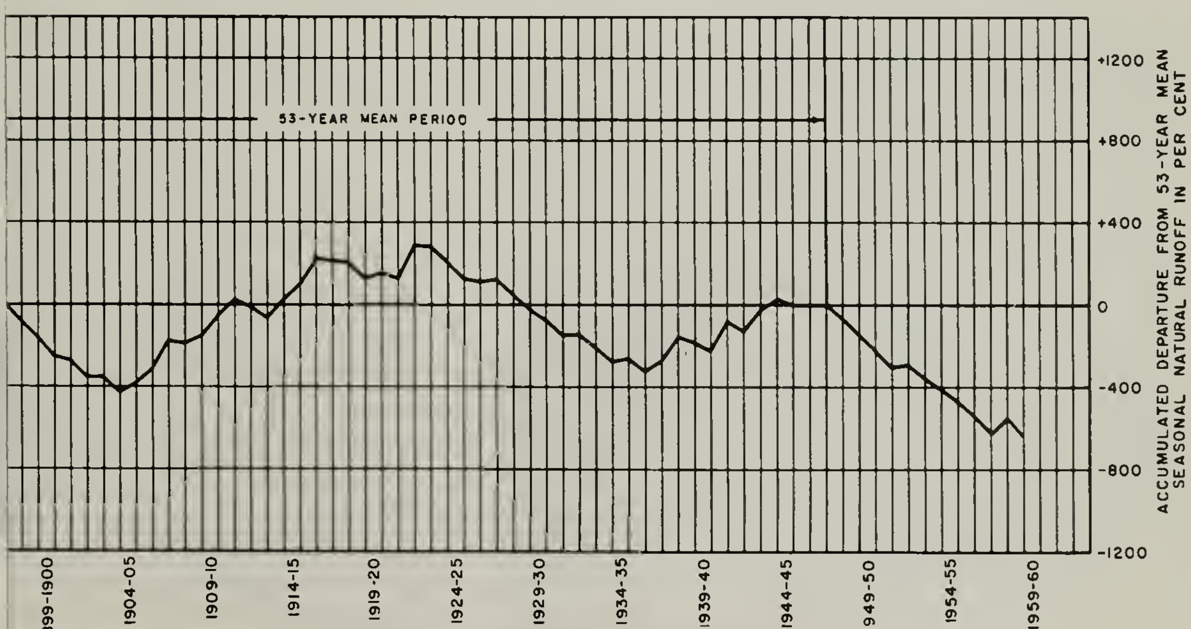
ACCUMULATED DEPARTURE FROM MEAN SEASONAL PRECIPITATION

REPRESENTATIVE PRECIPITATION CHARACTERISTICS IN SOUTHERN CALIFORNIA

DEPARTMENT OF WATER RESOURCES, SOUTHERN CALIFORNIA DISTRICT 1961



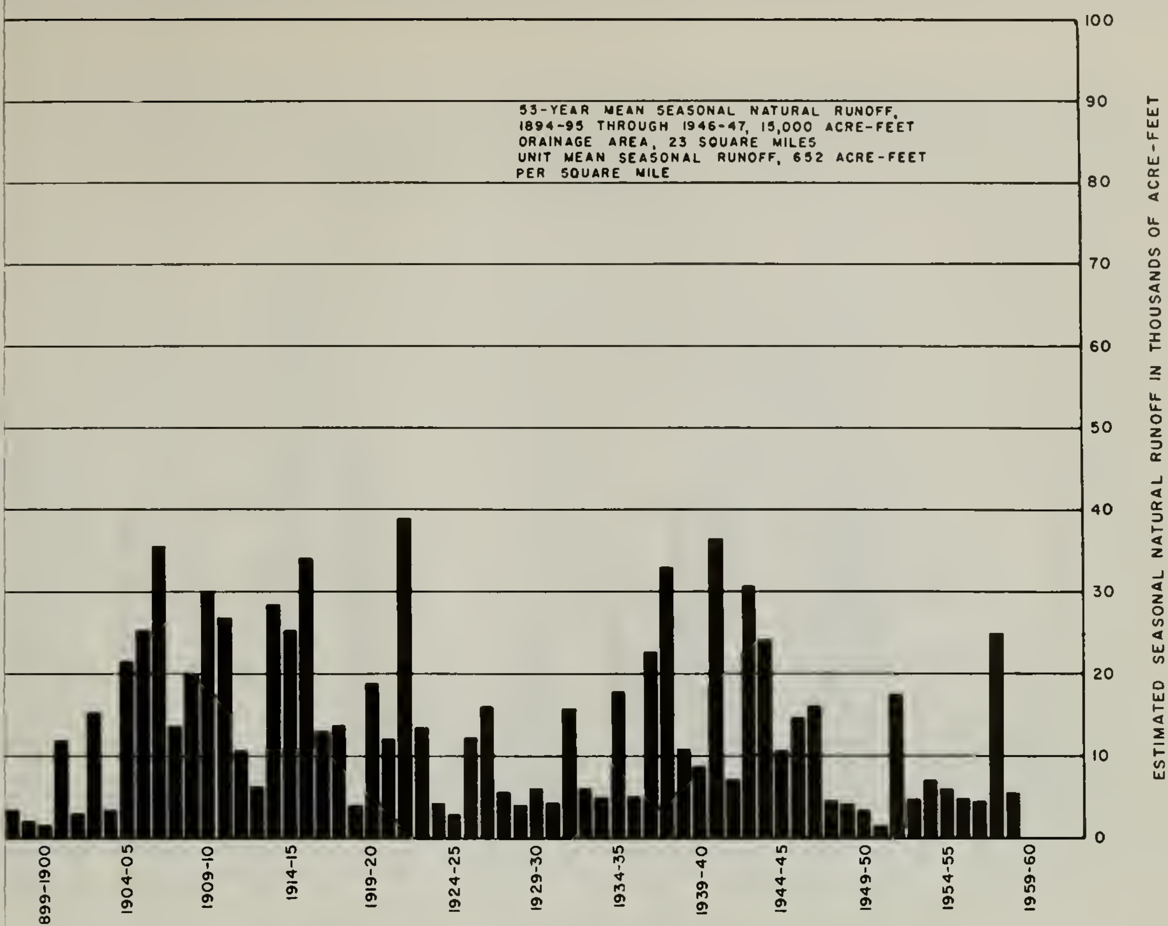
ROCK CREEK NEAR VALYERMO



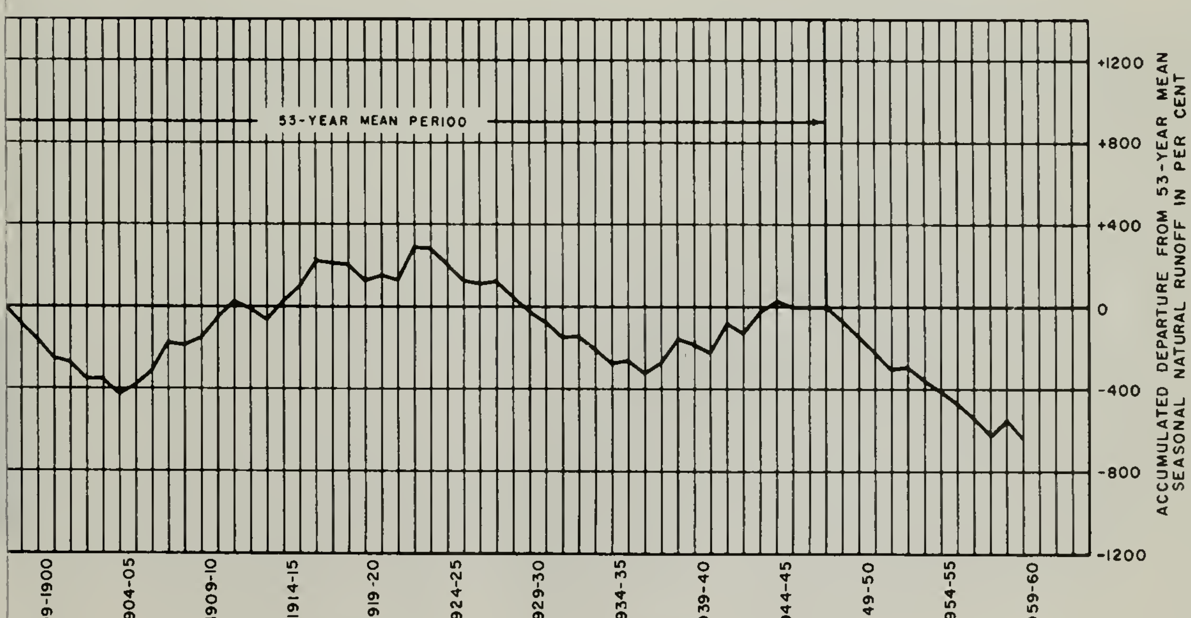
ROCK CREEK NEAR VALYERMO

O F F

A L I F O R N I A



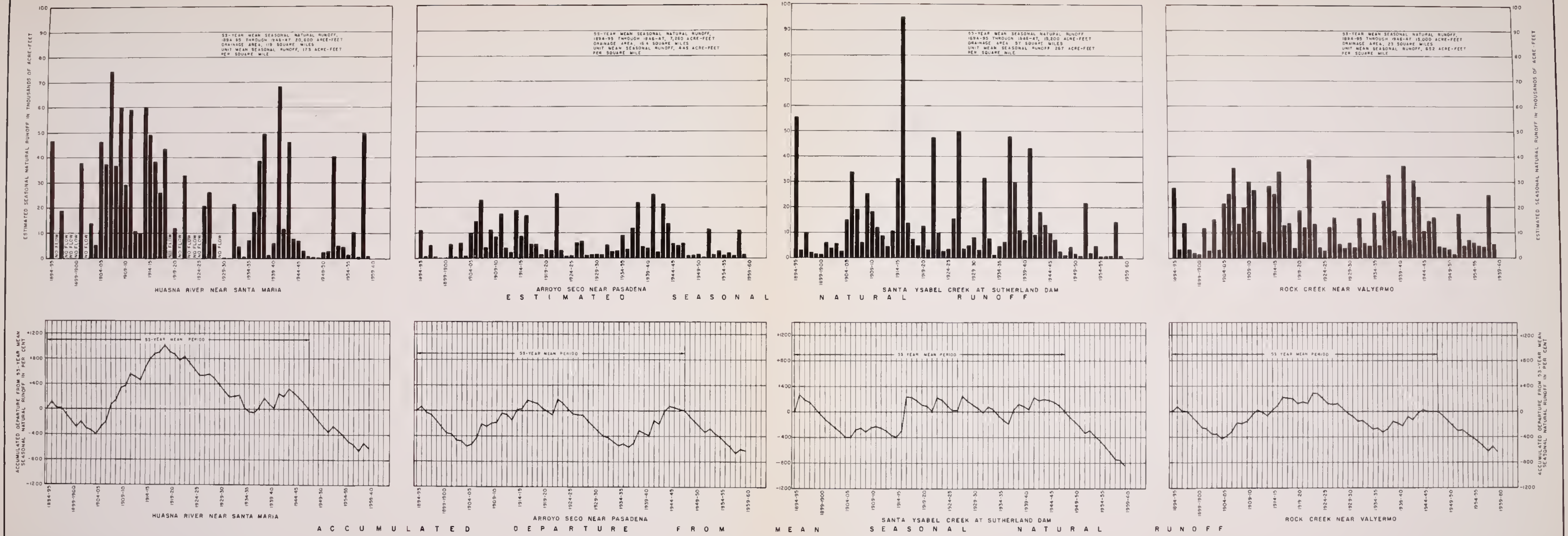
ROCK CREEK NEAR VALYERMO



ROCK CREEK NEAR VALYERMO

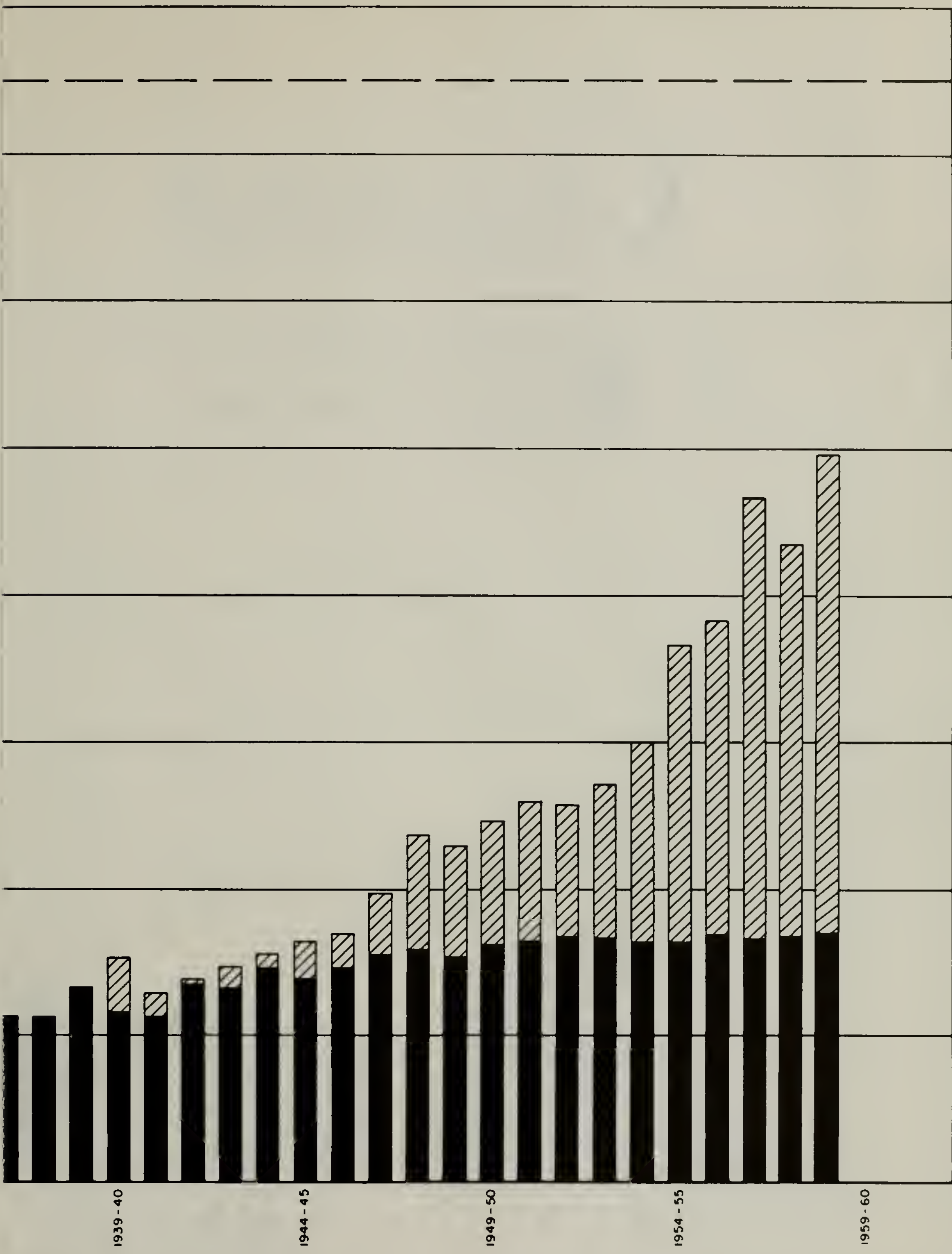
O F F

ALIFORNIA



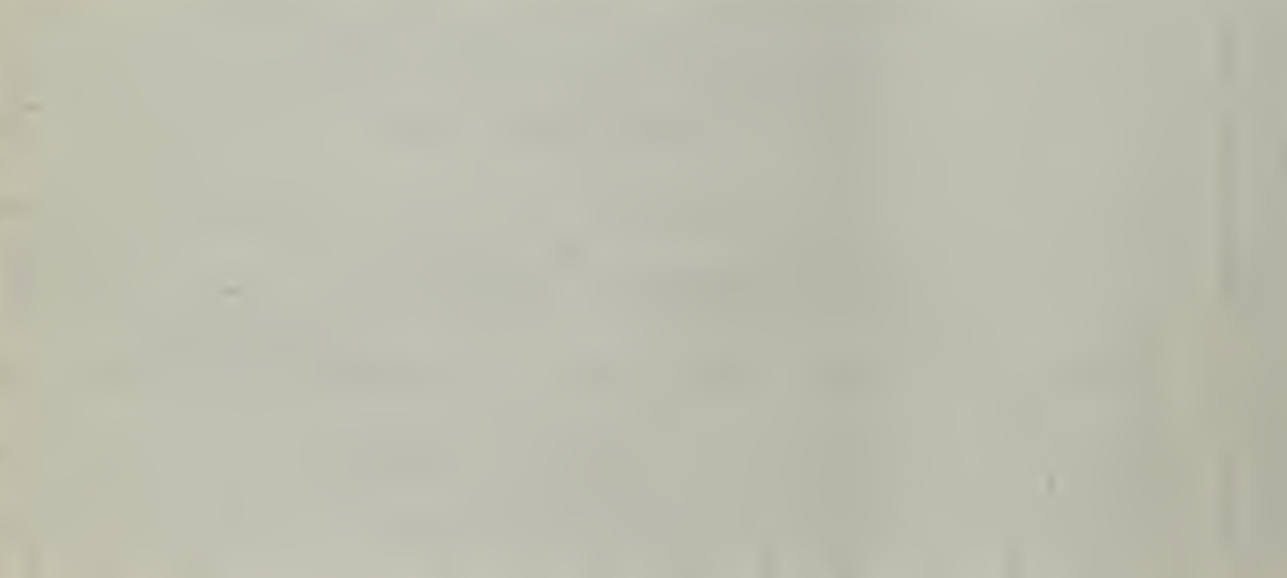
REPRESENTATIVE RUNOFF CHARACTERISTICS IN SOUTHERN CALIFORNIA

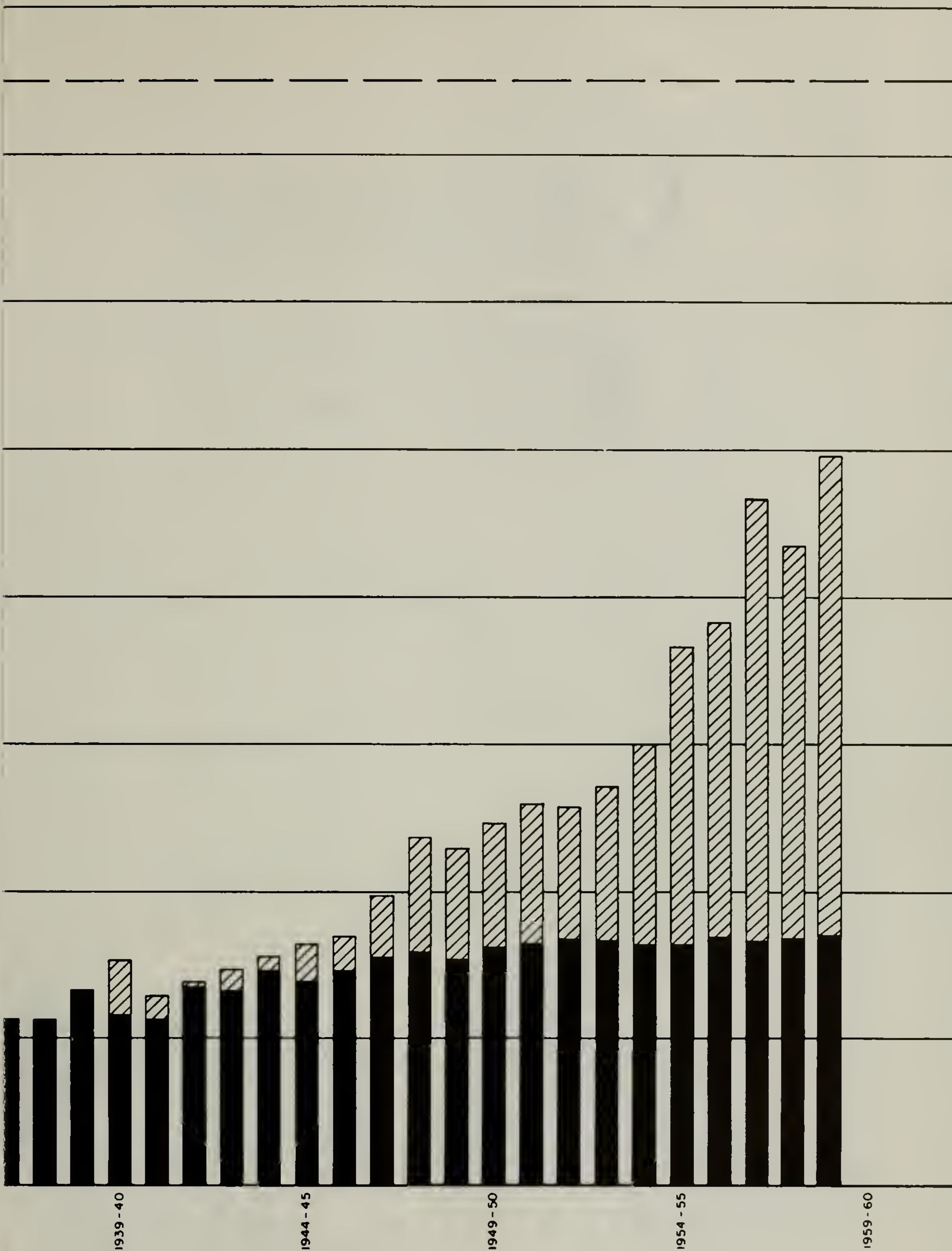
DEPARTMENT OF WATER RESOURCES, SOUTHERN CALIFORNIA DISTRICT 1961



OF WATER TO COASTAL
CALIFORNIA

43717

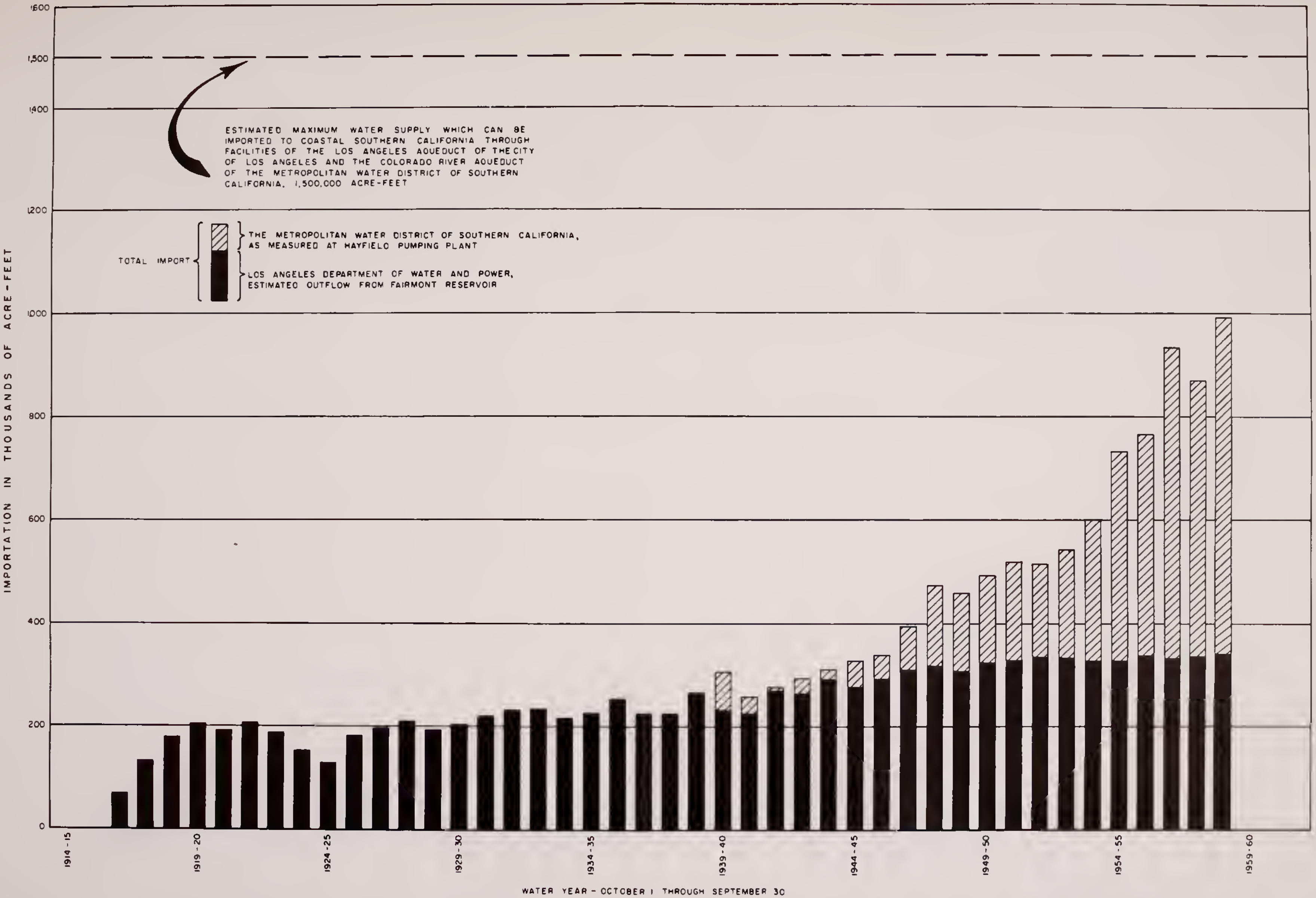




R I THROUGH SEPTEMBER 30

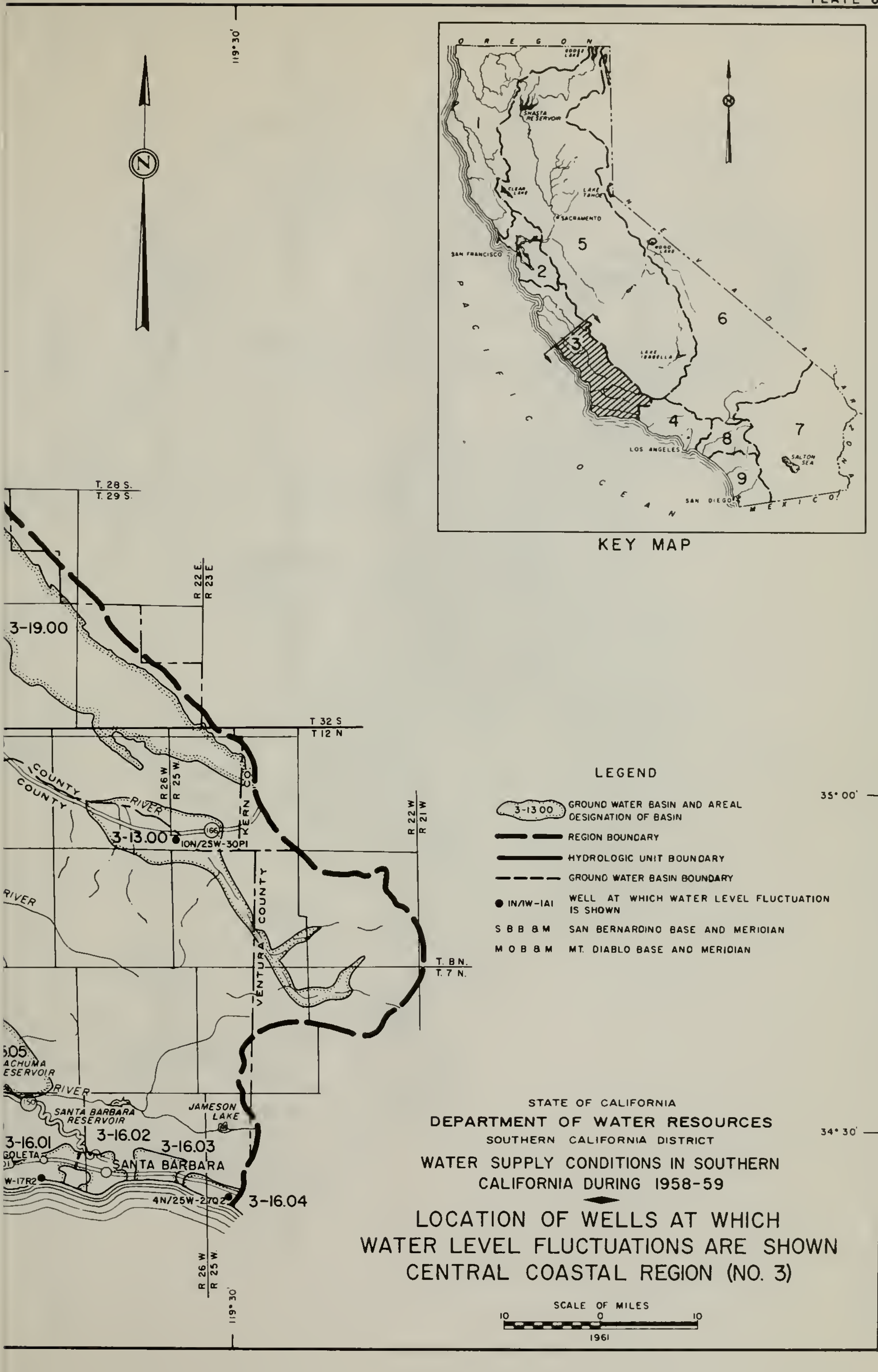
OF WATER TO COASTAL
CALIFORNIA

43717



HISTORICAL IMPORTATIONS OF WATER TO COASTAL SOUTHERN CALIFORNIA

PLATE 6



KEY MAP
OREGON
NEVADA
ARIZONA
MEXICO
PACIFIC OCEAN
SHASTA RESERVOIR
CLEAR LAKE
LAKE TAHOE
SACRAMENTO
SAN FRANCISCO
MONO LAKE
LAKE ISABELLA
LOS ANGELES
SAN DIEGO
SALTON SEA
1
2
3
4
5
6
7
8
9
LEGEND
3-13.00 GROUND WATER BASIN AND AREAL DESIGNATION OF BASIN
REGION BOUNDARY
HYDROLOGIC UNIT BOUNDARY
GROUND WATER BASIN BOUNDARY
IN/IW-IAI WELL AT WHICH WATER LEVEL FLUCTUATION IS SHOWN
S B B & M SAN BERNARDINO BASE AND MERIDIAN
M D B & M MT. DIABLO BASE AND MERIDIAN
119° 30'
35° 00'
34° 30'
T. 28 S.
T. 29 S.
T 32 S
T 12 N
T. 8 N.
T. 7 N.
R 22 E.
R 23 E.
R 26 W
R 25 W
R 22 W
R 21 W
3-19.00
3-13.00
10N/25W-30P1
KERN CO.
VENTURA COUNTY
COUNTY
COUNTY
RIVER
RIVER
RIVER
166
150
CACHUMA RESERVOIR
SANTA BARBARA RESERVOIR
JAMESON LAKE
3-16.01
3-16.02
3-16.03
3-16.04
GOLETA
SANTA BARBARA
4N/25W-27Q2
STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN CALIFORNIA DISTRICT
WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59
LOCATION OF WELLS AT WHICH WATER LEVEL FLUCTUATIONS ARE SHOWN CENTRAL COASTAL REGION (NO. 3)
SCALE OF MILES
10 0 10
1961

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN CALIFORNIA DISTRICT

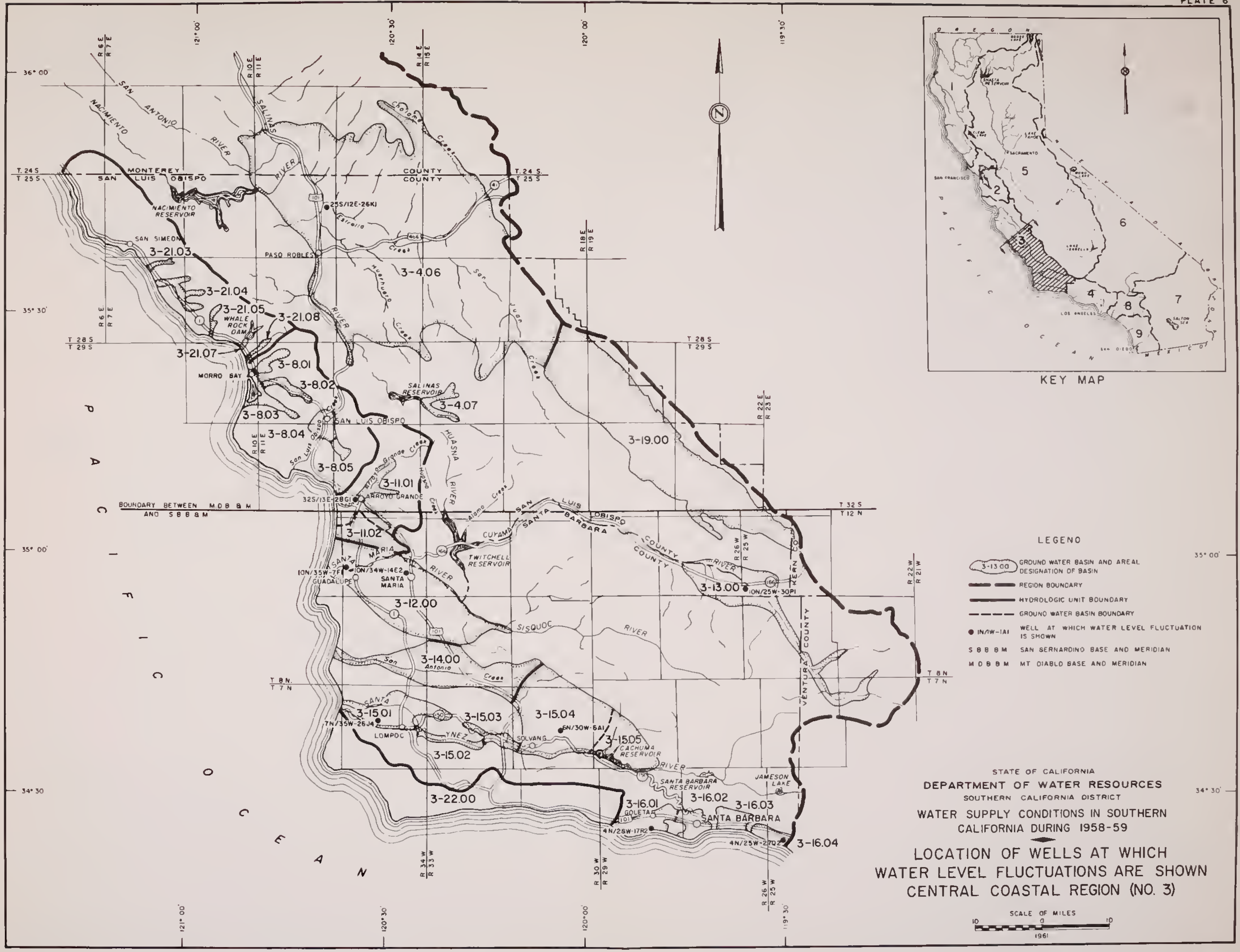
WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59

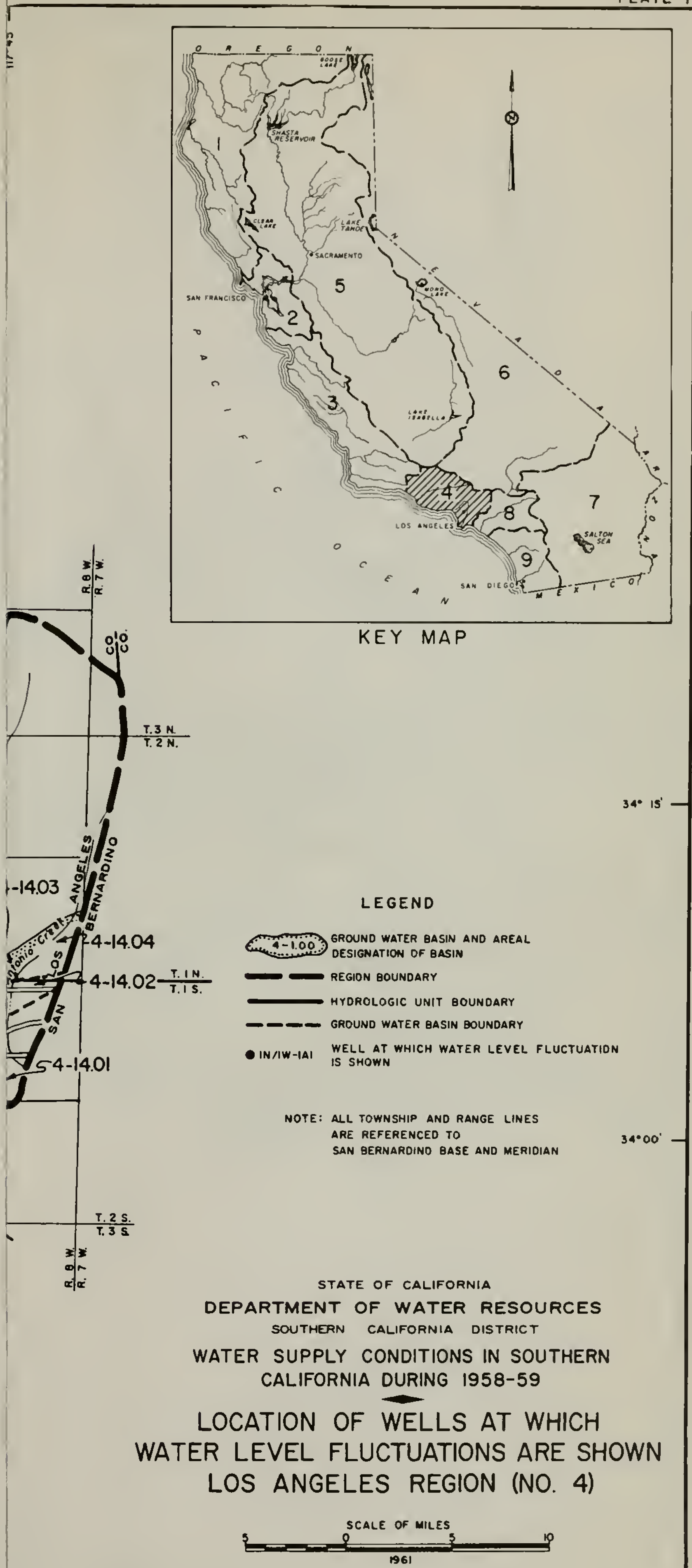
LOCATION OF WELLS AT WHICH WATER LEVEL FLUCTUATIONS ARE SHOWN CENTRAL COASTAL REGION (NO. 3)

1961

NUMERICAL DESIGNATIONS OF
GROUND WATER BASINS

3-4.00	Salinas Valley
3-4.06	Paso Robles Basin
3-4.07	Pozo Basin
3-8.00	San Luis Obispo Group
3-8.01	Morro Basin
3-8.02	Chorro Basin
3-8.03	Los Osos Basin
3-8.04	San Luis Obispo Basin
3-8.05	Pismo Basin
3-11.00	Arroyo Grande Group
3-11.01	Arroyo Grande Basin
3-11.02	Nipomo Mesa Basin
3-12.00	Santa Maria River Valley
3-13.00	Cuyama River Valley
3-14.00	San Antonio Creek Valley
3-15.00	Santa Ynez River Valley
3-15.01	Lompoc Subarea
3-15.02	Santa Rita Subarea
3-15.03	Buellton Subarea
3-15.04	Santa Ynez Subarea
3-15.05	Headwater Subarea
3-16.00	South Coast Basins (Santa Barbara County)
3-16.01	Goleta Basin
3-16.02	Santa Barbara Basin
3-16.03	Montecito Subarea
3-16.04	Carpinteria Basin
3-19.00	Carrizo Plain
3-21.00	Cambria Group
3-21.03	San Simeon Basin
3-21.04	Santa Rosa Basin
3-21.05	Villa Basin
3-21.08	Toro Basin
3-22.00	Santa Barbara County Coastal Group



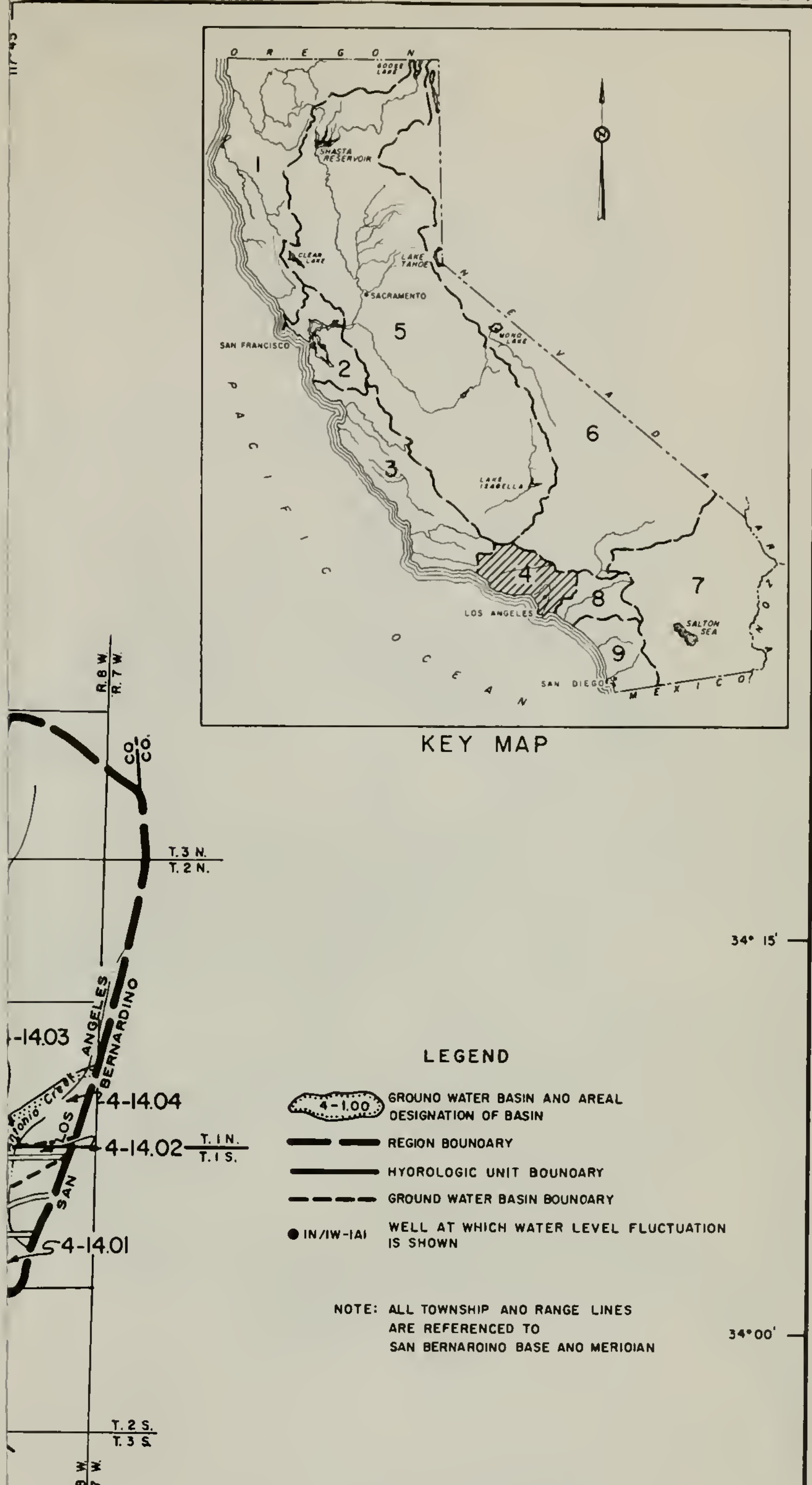


STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN CALIFORNIA DISTRICT

WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59

LOCATION OF WELLS AT WHICH WATER LEVEL FLUCTUATIONS ARE SHOWN
LOS ANGELES REGION (NO. 4)

PLATE 7



STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN CALIFORNIA DISTRICT

WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59

LOCATION OF WELLS AT WHICH WATER LEVEL FLUCTUATIONS ARE SHOWN LOS ANGELES REGION (NO. 4)

SCALE OF MILES
5 0 5 10

1961

NUMERICAL DESIGNATIONS OF
GROUND WATER BASINS

4-1.00	Upper Ojai Valley
4-2.00	Ojai Valley
4-3.00	Ventura River Valley
4-3.01	Lower Ventura River Basin
4-3.02	Upper Ventura River Basin
4-4.00	Santa Clara River Valley
4-4.01	Oxnard Plain Pressure Area
4-4.02	Oxnard Plain Forebay Area
4-4.03	Mound Pressure Area
4-4.04	Santa Paula Basin
4-4.05	Fillmore Basin
4-4.06	Piru Basin
4-4.07	Eastern Basin
4-5.00	Acton Valley
4-6.00	Pleasant Valley
4-7.00	Arroyo Santa Rosa Valley
4-8.00	Las Posas Valley
4-8.01	West Las Posas Basin
4-8.02	East Las Posas Basin
4-9.00	Simi Valley
4-10.00	Conejo Valley
4-11.00	Coastal Plain (Los Angeles County)
4-11.01	West Coast Basin North
4-11.02	West Coast Basin
4-11.03	Central Coastal Plain Pressure Area
4-11.04	Los Angeles Forebay Area
4-11.05	Montebello Forebay Area
4-11.06	Hollywood Basin
4-11.07	Los Angeles Narrows Basin
4-11.08	La Babra Basin
4-12.00	San Fernando Valley
4-12.01	San Fernando Basin
4-12.02	Bull Canyon Basin
4-12.03	Sylmar Basin
4-12.04	Pacoima Basin
4-12.05	Tujunga Basin
4-12.06	Little Tujunga Basin
4-12.07	Verdugo Basin
4-13.00	San Gabriel Valley
4-13.01	Main San Gabriel Basin
4-13.02	Monk Hill Basin
4-13.03	Pasadena Subarea
4-13.04	Santa Anita Subarea
4-13.05	Upper Canyon Basin
4-13.06	Lower Canyon Basin
4-13.07	Glendora Basin
4-13.08	Way Hill Basin
4-13.09	San Dimas Basin
4-13.10	Foothill Basin
4-13.11	Spadra Basin
4-13.12	Puente Basin
4-14.00	Upper Santa Ana Valley (Los Angeles County)
4-14.01	Chino Basin
4-14.02	Pomona Basin
4-14.03	Live Oak Basin
4-14.04	Claremont Heights Basin
4-15.00	Tierra Rejada Valley
4-16.00	Malibu Coastal Group
4-16.01	Hidden Valley Basin
4-16.02	Russell Basin
4-16.05	Arroyo Sequit Canyon Basin
4-16.09	Trancas Canyon Basin
4-16.10	Zuma Canyon Basin
4-16.11	Ramera Canyon Basin
4-16.14	Solstice Canyon Basin
4-16.16	Malibu Creek Basin
4-16.19	Las Flores Canyon Basin
4-16.20	Piedra Gorda Canyon Basin
4-16.25	Las Virgenes Canyon Basin

35°00'

T8N
T7N
R13E
R12E

KEY MAP

115° 30'

LEGEND

6-900	GROUND WATER BASIN AND AREAL DESIGNATION OF BASIN
	REGION BOUNDARY
	HYDROLOGIC UNIT BOUNDARY
	GROUND WATER BASIN BOUNDARY
● IN/IW-1A1	WELL AT WHICH WATER LEVEL FLUCTUATION IS SHOWN
M D B.& M.	MT DIABLO BASE AND MERIDIAN
S B B & M	SAN BERNARDINO BASE & MERIDIAN

116°00'

BERNARDINO MERIDIAN

116° 30'

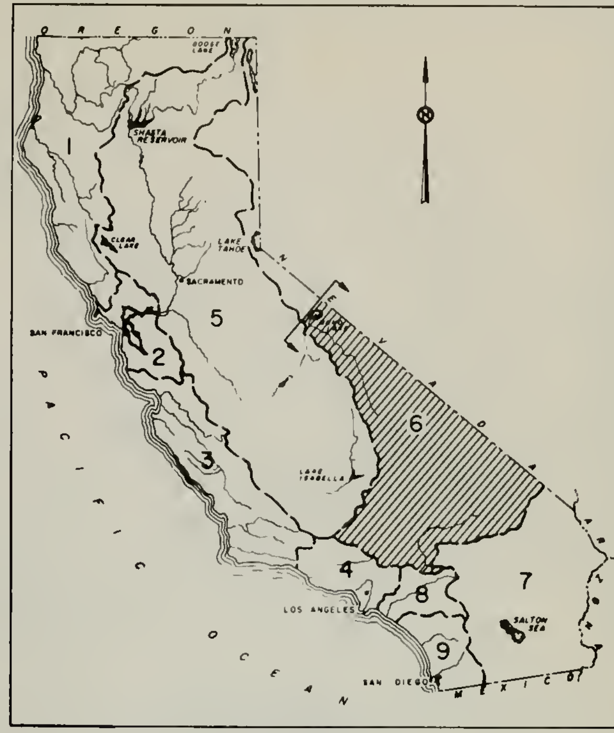
STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN CALIFORNIA DISTRICT

WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59

LOCATION OF WELLS AT WHICH WATER LEVEL FLUCTUATIONS ARE SHOWN LAHONTAN REGION (NO. 6)

SCALE OF MILES
10 0 10 20

118°00'



KEY MAP

35°00'

T8N
T7N
R13E
R12E

115°30'

LEGEND

6-900	GROUND WATER BASIN AND AREAL DESIGNATION OF BASIN
	REGION BOUNDARY
	HYDROLOGIC UNIT BOUNDARY
	GROUND WATER BASIN BOUNDARY
● IN/IW-IAI	WELL AT WHICH WATER LEVEL FLUCTUATION IS SHOWN
M D B & M	MT DIABLO BASE AND MERIDIAN
S B B & M	SAN BERNARDINO BASE & MERIDIAN

116°00'

BERNARDINO MERIDIAN

116°30'

STATE OF CALIFORNIA

DEPARTMENT OF WATER RESOURCES

SOUTHERN CALIFORNIA DISTRICT

WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59

LOCATION OF WELLS AT WHICH WATER LEVEL FLUCTUATIONS ARE SHOWN LAHONTAN REGION (NO. 6)

SCALE OF MILES

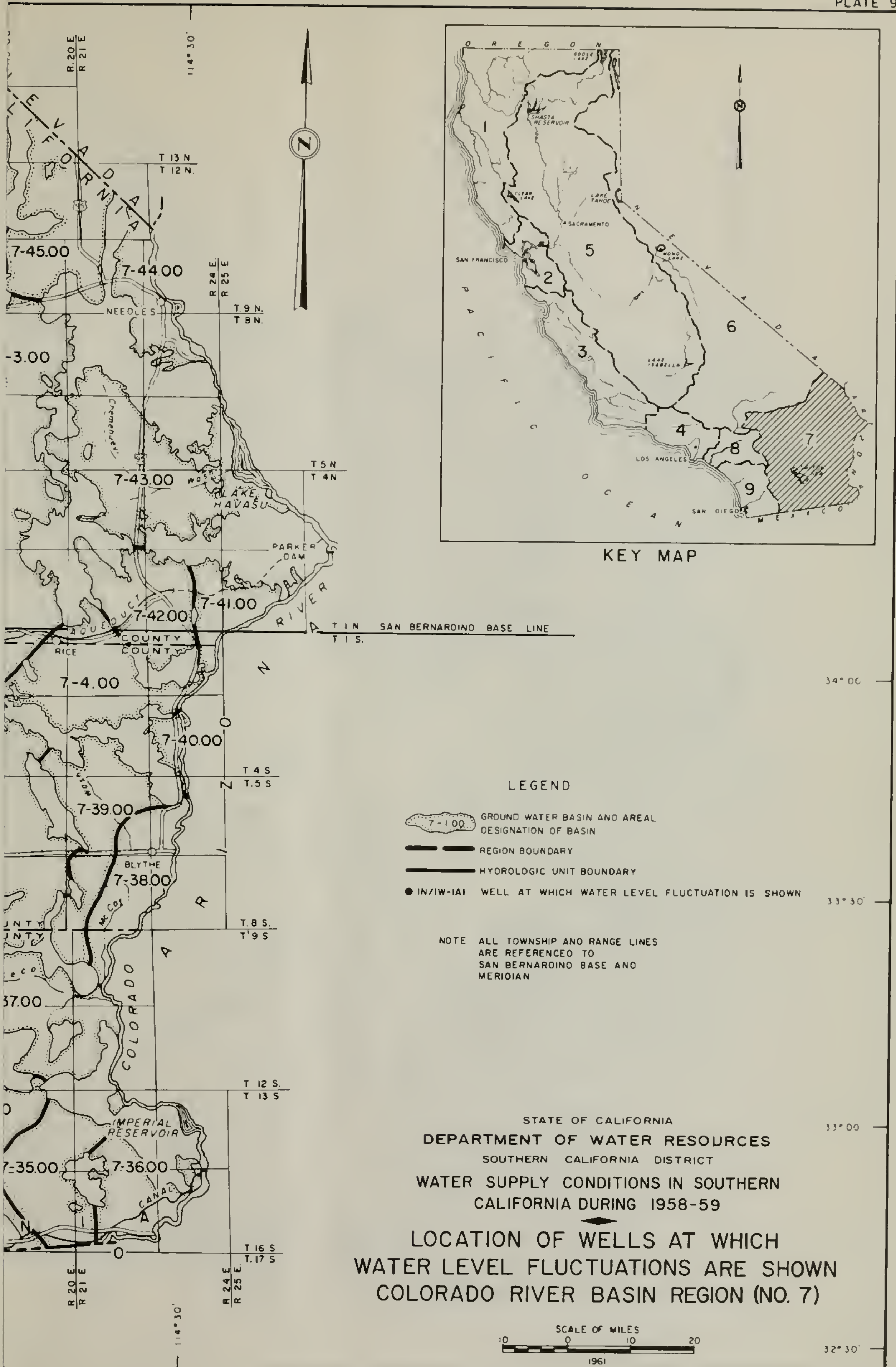
10 0 10 20

118°00'

·96

NUMERICAL DESIGNATIONS OF GROUND WATER BASINS

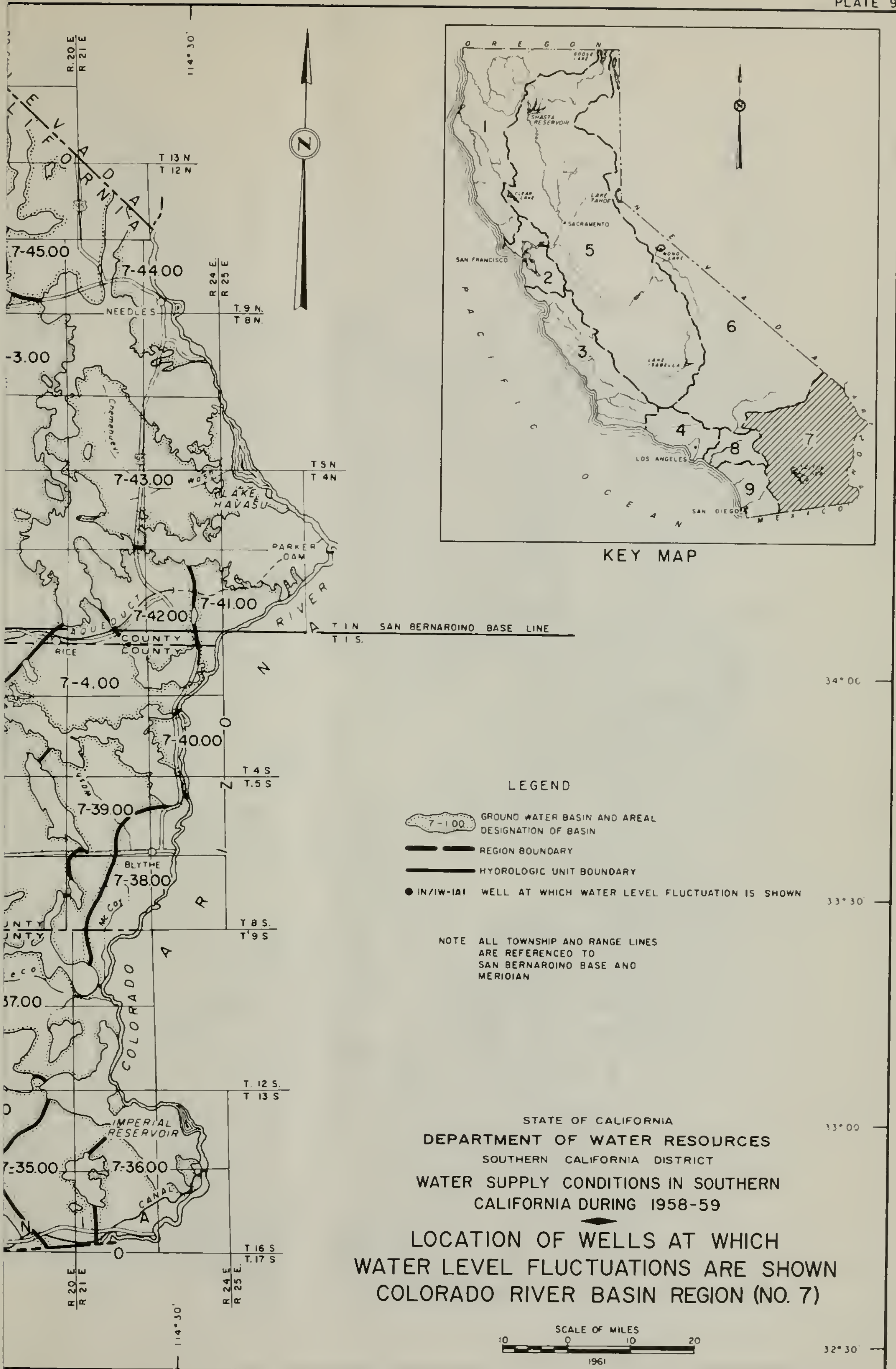
6-9.00	Mono Valley
6-10.00	Adobe Lake Valley
6-11.00	Long Valley
6-12.00	Owens Valley
6-13.00	Black Springs Valley
6-14.00	Fish Lake Valley
6-15.00	Deep Springs Valley
6-16.00	Eureka Valley
6-17.00	Saline Valley
6-18.00	Death Valley
6-19.00	Wingate Valley
6-20.00	Middle Amargosa Valley
6-21.00	Lower Kingston Valley
6-22.00	Upper Kingston Valley
6-23.00	Riggs Valley
6-24.00	Red Pass Valley
6-25.00	Bicycle Valley
6-26.00	Avawatz Valley
6-27.00	Leach Valley
6-28.00	Pahrump Valley
6-29.00	Mesquite Valley
6-30.00	Ivanpah Valley
6-31.00	Kelso Valley
6-32.00	Broadway Valley
6-33.00	Soda Lake Valley
6-34.00	Silver Lake Valley
6-35.00	Cronise Valley
6-36.00	Langford Valley
6-37.00	Coyote Lake Valley
6-38.00	Caves Canyon Valley
6-39.00	Troy Valley
6-40.00	Lower Mojave River Valley
6-41.00	Middle Mojave River Valley
6-42.00	Upper Mojave River Valley
6-43.00	El Mirage Valley
6-44.00	Antelope Valley
6-44.01	Neenach Basin
6-44.02	Willow Springs Basin
6-44.03	Gloster Basin
6-44.04	Chaffee Basin
6-44.05	Lancaster Basin
6-44.06	Buttes Basin
6-44.07	Rock Creek Basin
6-44.08	North Muroc Basin
6-45.00	Tehachapi Valley East
6-46.00	Fremont Valley
6-47.00	Harper Valley
6-48.00	Goldstone Valley
6-49.00	Superior Valley
6-50.00	Cuddeback Valley
6-51.00	Pilot Knob Valley
6-52.00	Searles Valley
6-53.00	Salt Wells Valley
6-54.00	Indian Wells Valley
6-55.00	Coso Valley
6-56.00	Rose Valley
6-57.00	Darwin Valley
6-58.00	Panamint Valley



STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN CALIFORNIA DISTRICT

WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59

LOCATION OF WELLS AT WHICH WATER LEVEL FLUCTUATIONS ARE SHOWN COLORADO RIVER BASIN REGION (NO. 7)



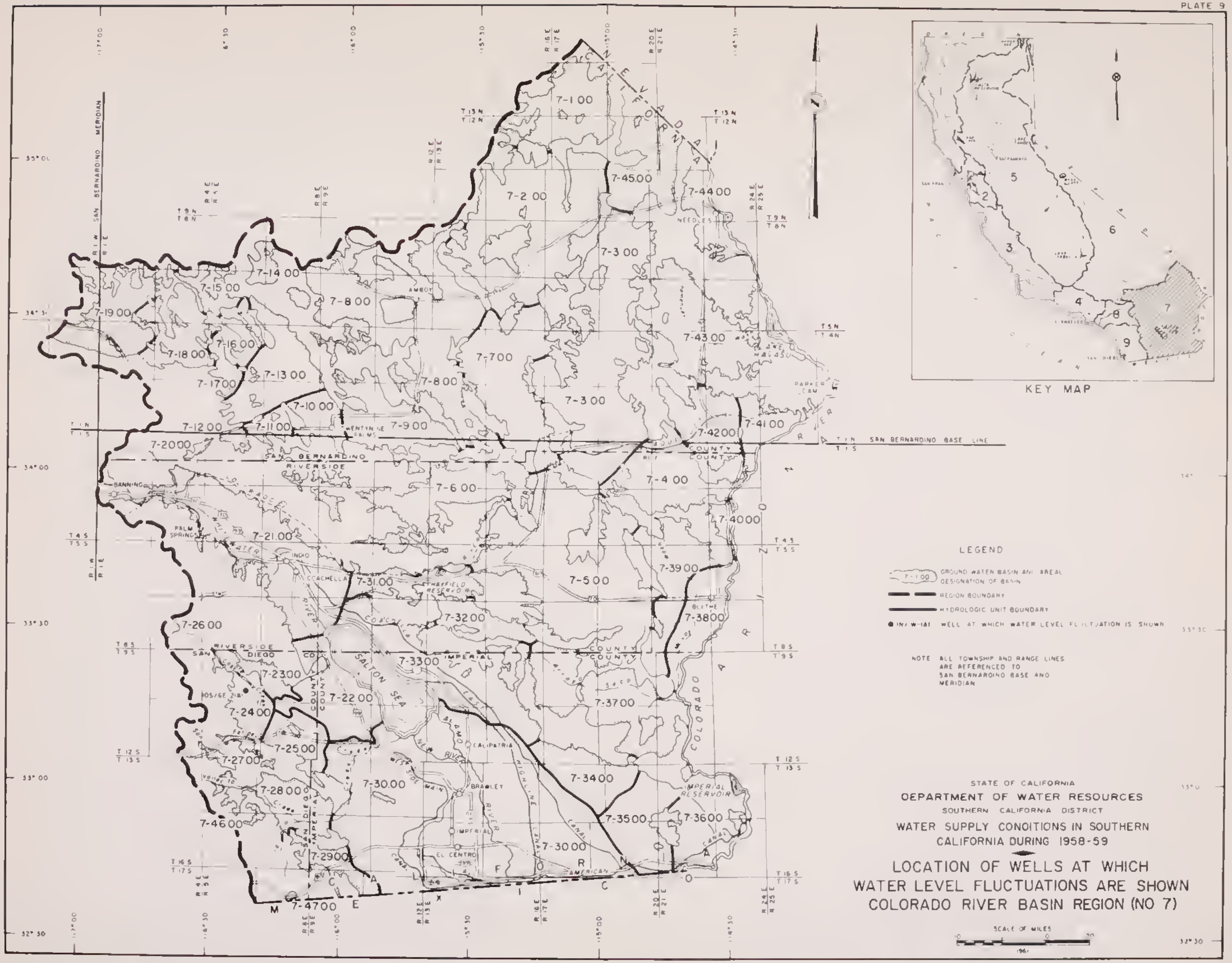
STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN CALIFORNIA DISTRICT
WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59

LOCATION OF WELLS AT WHICH WATER LEVEL FLUCTUATIONS ARE SHOWN
COLORADO RIVER BASIN REGION (NO. 7)

NUMERICAL DESIGNATIONS OF
GROUND WATER BASINS

7-1.00	Lanfair Valley
7-2.00	Fenner Valley
7-3.00	Ward Valley
7-4.00	Rice Valley
7-5.00	Chuckawalla Valley
7-6.00	Pinto Valley
7-7.00	Cadiz Valley
7-8.00	Bristol Valley
7-9.00	Dale Valley
7-10.00	Twentynine Palms Valley
7-11.00	Copper Mountain Valley
7-12.00	Warren Valley
7-13.00	Deadman Valley
7-14.00	Lavic Valley
7-15.00	Bessemer Valley
7-16.00	Ames Valley
7-17.00	Means Valley
7-18.00	Johnson Valley
7-19.00	Lucerne Valley
7-20.00	Morongo Valley
7-21.00	Coachella Valley
7-22.00	West Salton Sea Valley
7-23.00	Clark Valley
7-24.00	Borrego Valley
7-25.00	Ocotillo Valley
7-26.00	Terwilliger Valley
7-27.00	San Felipe Valley
7-28.00	Vallecito-Carrizo Valley
7-29.00	Coyote Wells Valley
7-30.00	Imperial Valley
7-31.00	Orcopia Valley
7-32.00	Chocolate Valley
7-33.00	East Salton Sea Valley
7-34.00	Amos Valley
7-35.00	Ogilby Valley
7-36.00	Yuma Valley
7-37.00	Arroyo Seco Valley
7-38.00	Palo Verde Valley
7-39.00	Palo Verde Mesa
7-40.00	Quien Sabe Point Valley
7-41.00	Calzona Valley
7-42.00	Vidal Valley
7-43.00	Chemehuevis Valley
7-44.00	Needles Valley
7-45.00	Piute Valley
7-46.00	Canebrake Valley
7-47.00	Jacumba Valley

PLATE 9



KEY MAP

34°00'

LEGEND

8-2.12 GROUND WATER BASIN AND AREAL DESIGNATION OF BASIN

REGION BOUNDARY

HYDROLOGIC UNIT BOUNDARY

GROUND WATER BASIN BOUNDARY

● IN/IW-IAI WELL AT WHICH WATER LEVEL FLUCTUATION IS SHOWN

33°45'

NOTE: ALL TOWNSHIP AND RANGE LINES ARE REFERENCED TO SAN BERNARDINO BASE AND MERIDIAN

STATE OF CALIFORNIA

DEPARTMENT OF WATER RESOURCES

SOUTHERN CALIFORNIA DISTRICT

WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59

33°30'

LOCATION OF WELLS AT WHICH WATER LEVEL FLUCTUATIONS ARE SHOWN SANTA ANA REGION (NO. 8)

SCALE OF MILES

5 0 5 10

1961

KEY MAP

34°00'

LEGEND

8-2.12 GROUND WATER BASIN AND AREAL DESIGNATION OF BASIN

REGION BOUNDARY

HYDROLOGIC UNIT BOUNDARY

GROUND WATER BASIN BOUNDARY

● 1N/1W-1A1 WELL AT WHICH WATER LEVEL FLUCTUATION IS SHOWN

33°45'

NOTE: ALL TOWNSHIP AND RANGE LINES ARE REFERENCED TO SAN BERNARDINO BASE AND MERIDIAN

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN CALIFORNIA DISTRICT

WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59

33°30'

LOCATION OF WELLS AT WHICH WATER LEVEL FLUCTUATIONS ARE SHOWN SANTA ANA REGION (NO. 8)

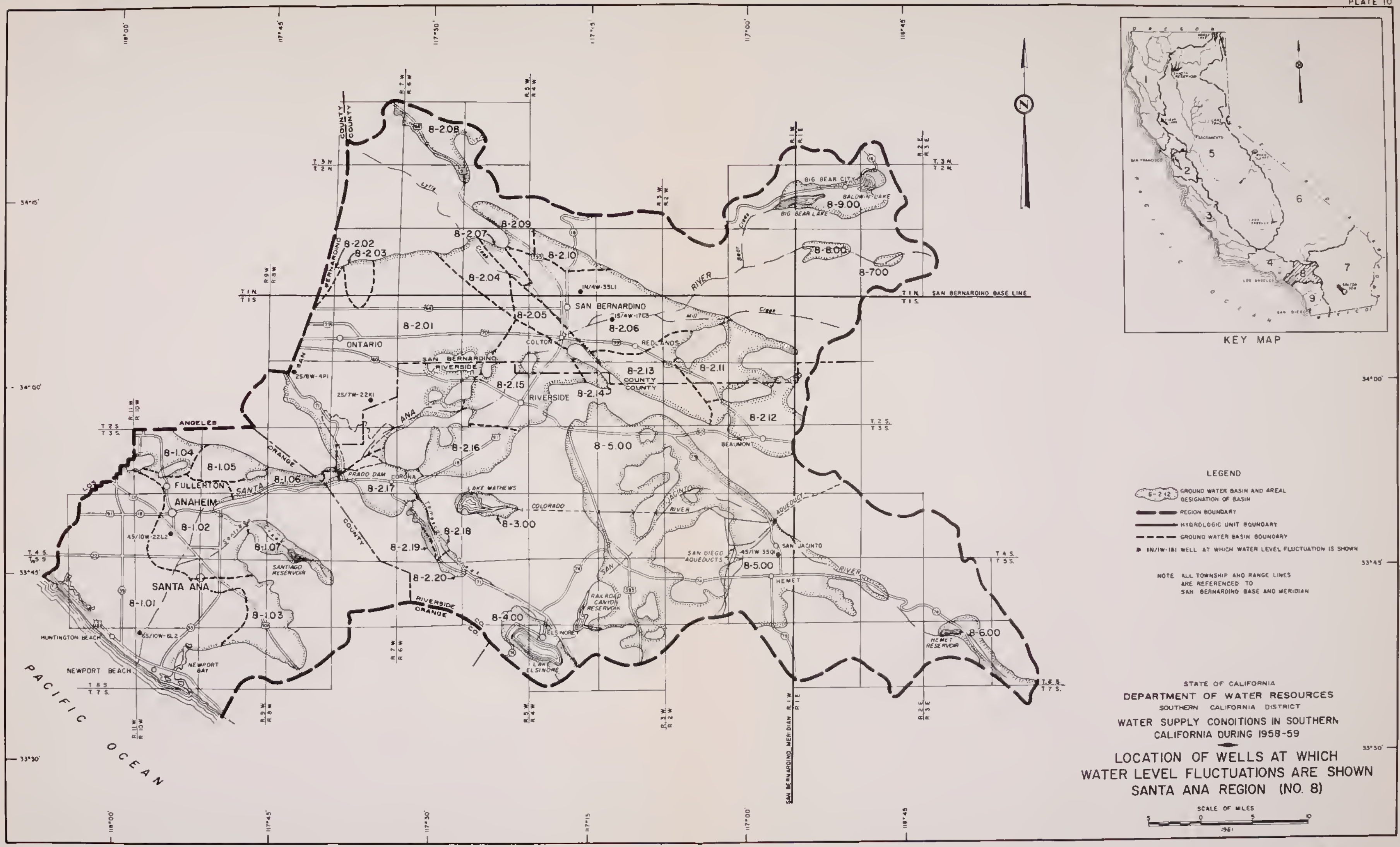
SCALE OF MILES

5 0 5 10

1961

NUMERICAL DESIGNATIONS OF
GROUND WATER BASINS

8-1.00		Coastal Plain (Orange County)
	8-1.01	East Coastal Plain Pressure Area
	8-1.02	Santa Ana Forebay Area
	8-1.03	Irvine Basin
	8-1.04	La Habra Basin
	8-1.05	Yorba Linda Basin
	8-1.06	Santa Ana Narrows Basin
	8-1.07	Santiago Basin
8-2.00		Upper Santa Ana Valley
	8-2.01	Chino Basin
	8-2.02	Claremont Heights Basin
	8-2.03	Cucamonga Basin
	8-2.04	Rialto Basin
	8-2.05	Colton Basin
	8-2.06	Bunker Hill Basin
	8-2.07	Lytle Basin
	8-2.08	Upper Cajon Basin
	8-2.09	Lower Cajon Basin
	8-2.10	Devil Canyon Basin
	8-2.11	Yucaipa Basin
	8-2.12	Beaumont Basin
	8-2.13	San Timoteo Basin
	8-2.14	Reche Canyon Basin
	8-2.15	Riverside Basin
	8-2.16	Arlington Basin
	8-2.17	Temescal Basin
	8-2.18	Bedford Basin
	8-2.19	Coldwater Basin
	8-2.20	Lee Lake Basin
8-3.00		Cajalco Valley
8-4.00		Elsinore Valley
8-5.00		San Jacinto Valley
8-6.00		Hemet Lake Valley
8-7.00		Big Meadows Valley
8-8.00		Seven Oaks Valley
8-9.00		Bear Valley



KEY MAP

33° 15'

LEGEND

9-B.00 GROUND WATER BASIN AND AREAL DESIGNATION OF BASIN

REGION BOUNDARY

HYDROLOGIC UNIT BOUNDARY

GROUND WATER BASIN BOUNDARY

● IN/IW-IAI WELL AT WHICH WHICH WATER LEVEL FLUCTUATION IS SHOWN

33° 00'

NOTE: ALL TOWNSHIP AND RANGE LINES ARE REFERENCED TO SAN BERNARDINO BASE AND MERIDIAN

32° 45'

STATE OF CALIFORNIA

DEPARTMENT OF WATER RESOURCES

SOUTHERN CALIFORNIA DISTRICT

WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59

LOCATION OF WELLS AT WHICH
TER LEVEL FLUCTUATIONS ARE SHOWN
SAN DIEGO REGION (NO. 9)

SCALE OF MILES

10 0 10

1961

32° 30'

KEY MAP

33° 15'

LEGEND

9-8.00 GROUND WATER BASIN AND AREAL DESIGNATION OF BASIN

REGION BOUNOARY

HYDROLOGIC UNIT BOUNOARY

GROUNO WATER BASIN BOUNOARY

● IN/IW-IAI WELL AT WHICH WHICH WATER LEVEL FLUCTUATION IS SHOWN

33° 00'

NOTE: ALL TOWNSHIP AND RANGE LINES ARE REFERENCEO TO SAN BERNAROINO BASE AND MERIOIAN

32° 45'

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN CALIFORNIA DISTRICT

WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59

LOCATION OF WELLS AT WHICH
TER LEVEL FLUCTUATIONS ARE SHOWN
SAN DIEGO REGION (NO. 9)

SCALE OF MILES
10 0 10

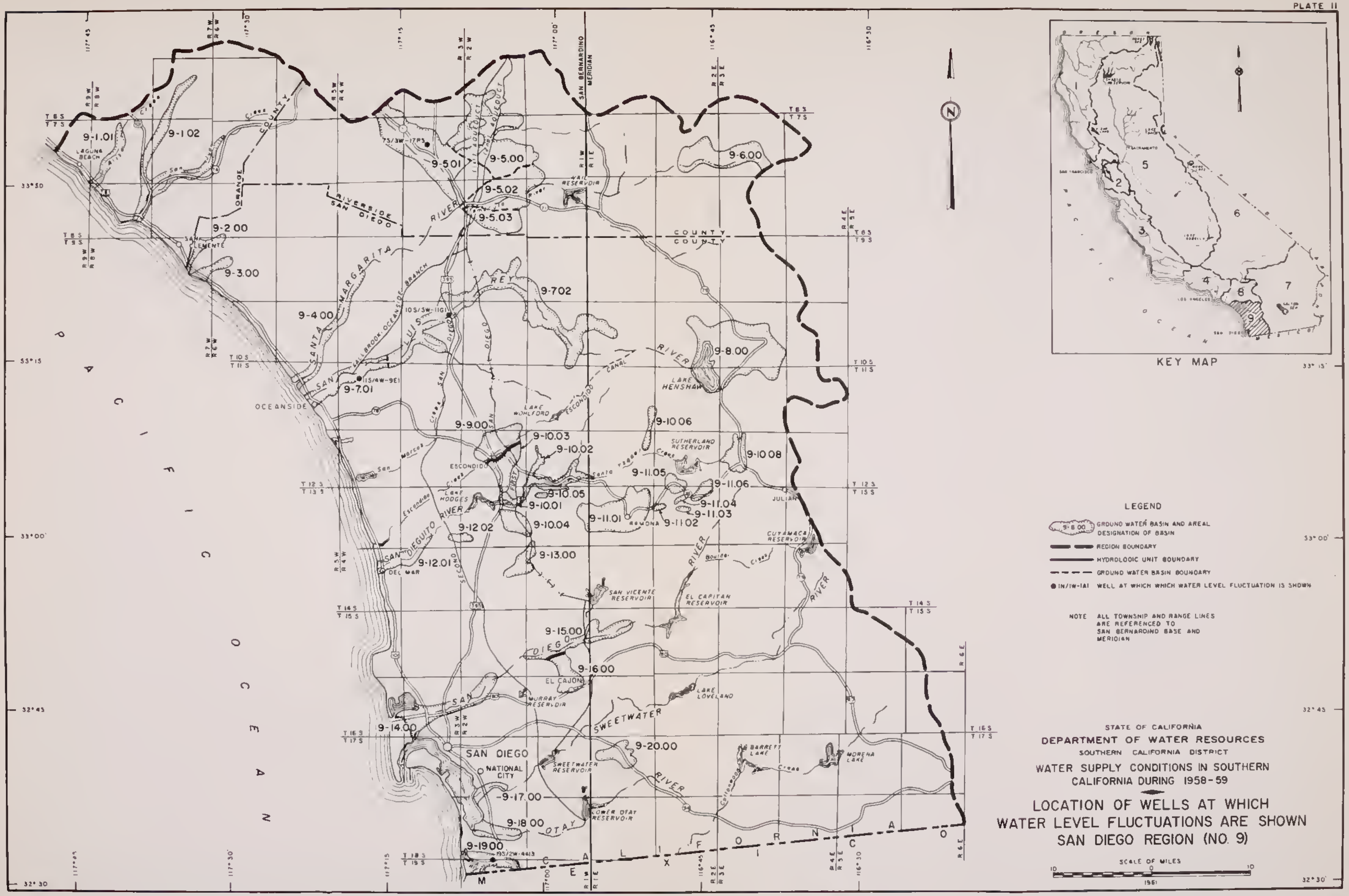
1961

32° 30'

NUMERICAL DESIGNATIONS OF
GROUND WATER BASINS

9-1.00	San Juan Valley
9-1.01	Aliso Creek Basin
9-1.02	San Juan Creek Basin
9-2.00	San Mateo Valley
9-3.00	San Onofre Valley
9-4.00	Santa Margarita Valley
9-5.00	Temecula Valley
9-5.01	Murrieta Basin
9-5.02	Pauba Basin
9-5.03	Wolf Basin (Pechanga)
9-6.00	Coahuila Valley
9-7.00	San Luis Rey Valley
9-7.01	Mission Basin
9-7.02	Bonsall Basin
9-8.00	Warner Valley
9-9.00	Escondido Valley
9-10.00	San Pasqual Valley
9-10.01	Lake Hodges Basin
9-10.02	San Pasqual Basin
9-10.03	Felicita Basin
9-10.04	Green Basin
9-10.05	Highland Basin
9-10.06	Pamo Basin
9-10.08	Santa Ysabel Basin
9-11.00	Santa Maria Valley
9-11.01	Ramona Basin
9-11.02	Lower Batfield Basin
9-11.03	Wash Hollow Basin
9-11.04	Upper Batfield Basin
9-11.05	Santa Teresa Basin
9-11.06	Ballena Basin
9-12.00	San Dieguito Valley
9-12.01	San Dieguito Basin
9-12.02	La Jolla Basin
9-13.00	Poway Valley
9-14.00	Mission Valley
9-15.00	San Diego River Valley
9-16.00	El Cajon Valley
9-17.00	Sweetwater Valley
9-18.00	Otay Valley
9-19.00	Tia Juana Valley
9-20.00	Jamul Valley

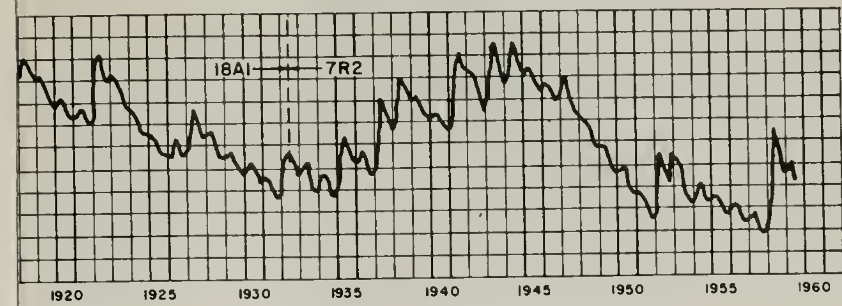
PLATE II



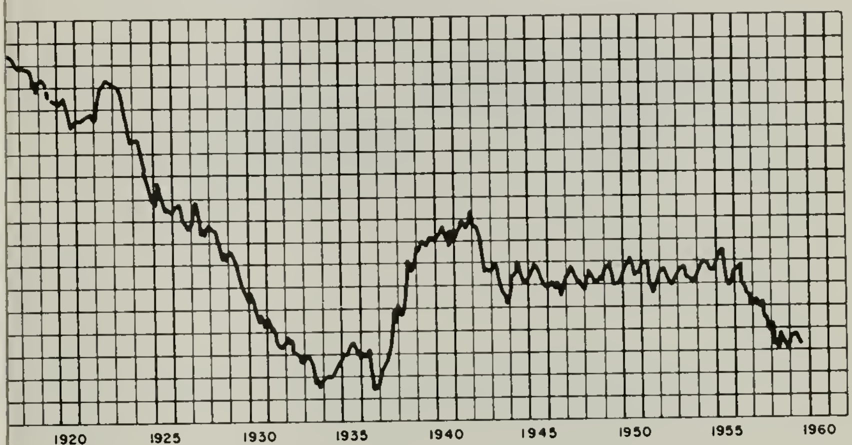
STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN CALIFORNIA DISTRICT
WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59

LOCATION OF WELLS AT WHICH WATER LEVEL FLUCTUATIONS ARE SHOWN SAN DIEGO REGION (NO. 9)

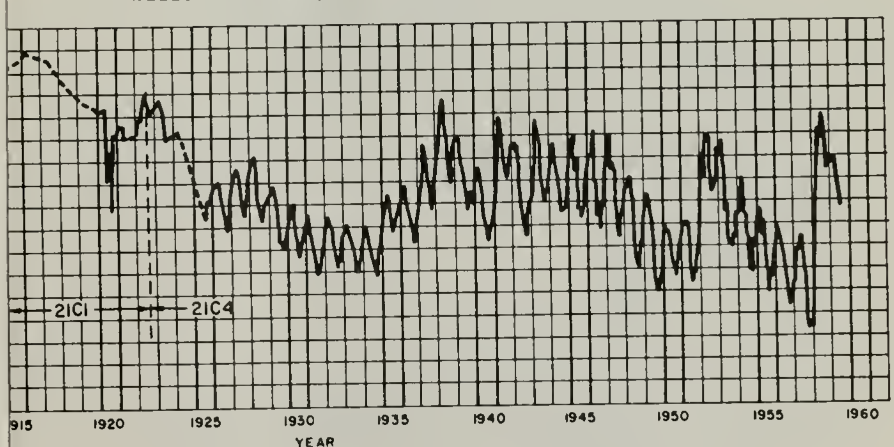
SAN GABRIEL VALLEY (4-13.00)
MAIN SAN GABRIEL BASIN (4-13.01)
WELLS 1S/10W-18A1, 7R2, S.B.B. & M.



PASADENA SUBAREA (4-13.03)
WELL 1N/12W-20B1, S.B.B. & M.

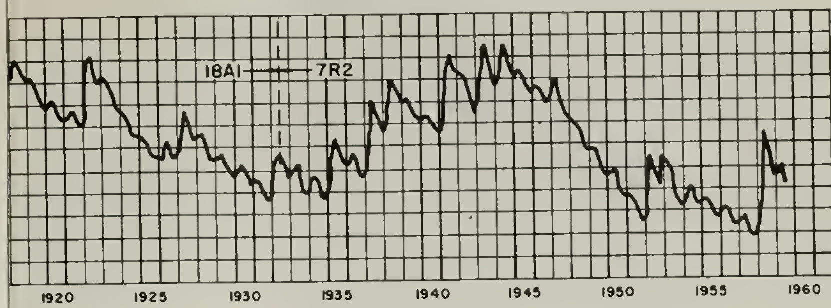


SANTA ANITA SUBAREA (4-13.04)
WELLS 1N/11W-21C2, C1, C4, S.B.B. & M.

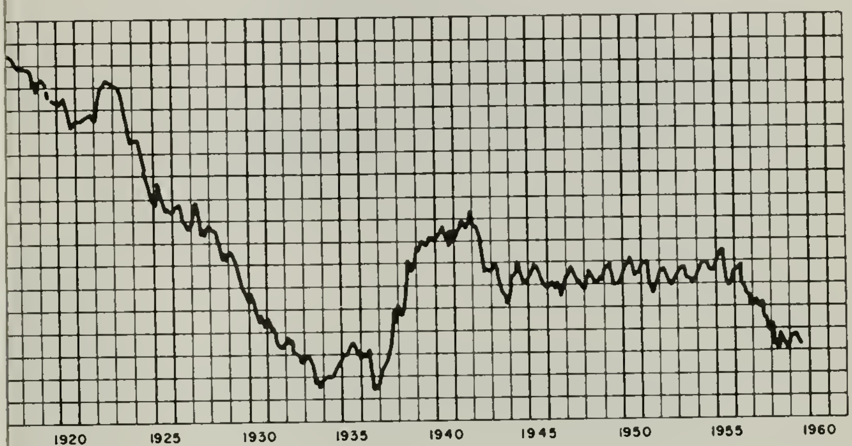


FLUCTUATION OF WATER LEVELS
AT KEY WELLS IN SOUTHERN CALIFORNIA

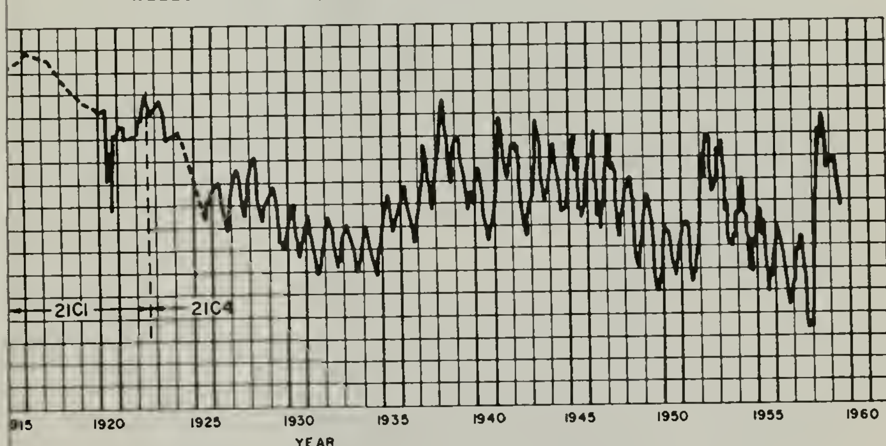
SAN GABRIEL VALLEY (4-13.00)
MAIN SAN GABRIEL BASIN (4-13.01)
WELLS 1S/10W-18A1, 7R2, S.B.B. & M.



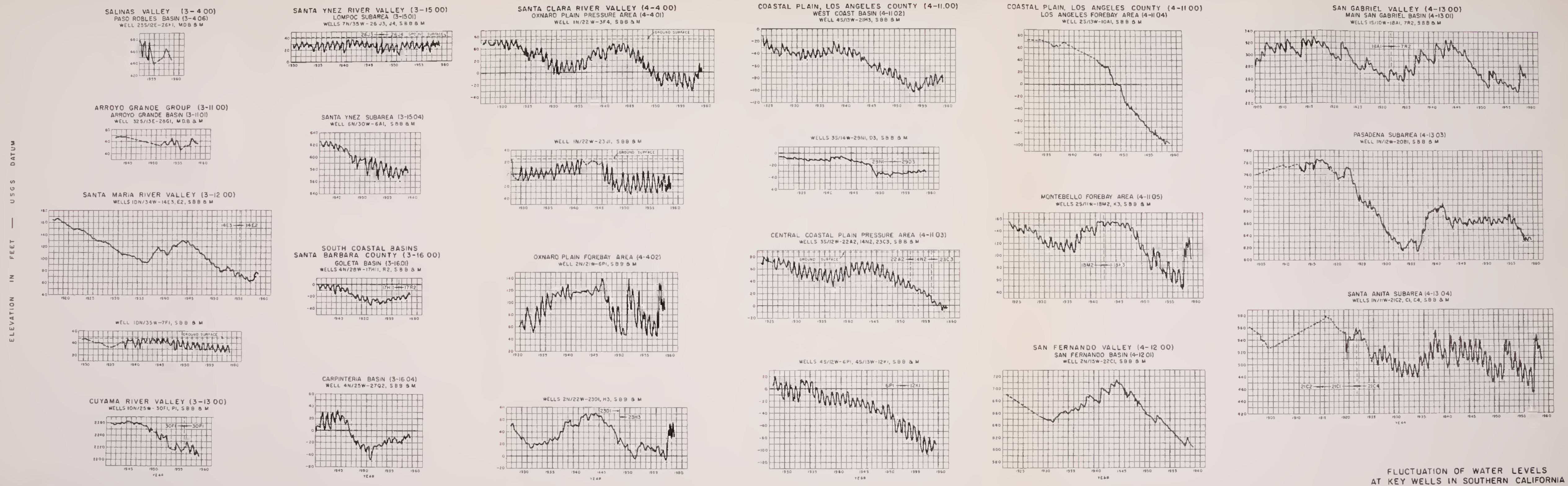
PASADENA SUBAREA (4-13.03)
WELL 1N/12W-20B1, S.B.B. & M.



SANTA ANITA SUBAREA (4-13.04)
WELLS 1N/11W-21C2, C1, C4, S.B.B. & M.



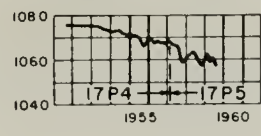
FLUCTUATION OF WATER LEVELS
AT KEY WELLS IN SOUTHERN CALIFORNIA



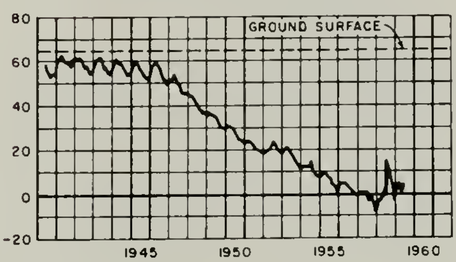
FLUCTUATION OF WATER LEVELS
AT KEY WELLS IN SOUTHERN CALIFORNIA

DEPARTMENT OF WATER RESOURCES SOUTHERN CALIFORNIA DISTRICT 1961

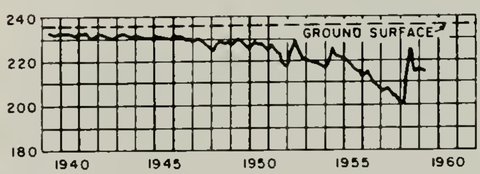
TEMECULA VALLEY (9-5.00)
MURRIETA BASIN (9-5.01)
WELLS 7S 3W-17P4, 17P5, S.B B. & M



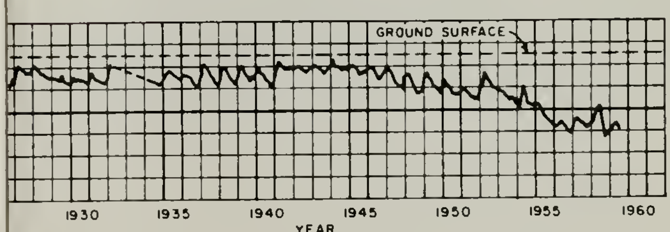
SAN LUIS REY VALLEY (9-7.00)
MISSION BASIN (9-7.01)
WELL 11S/4W-9E1, S B.B. & M.



BONSALL BASIN (9-7.02)
WELL 10S/3W-11G1, S.B B. & M.

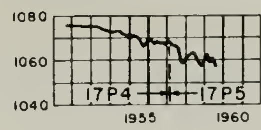


TIA JUANA VALLEY (9-19.00)
WELL 19S/2W-4A13, S.B.B. & M.

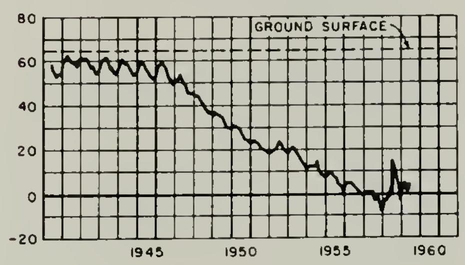


FLUCTUATION OF WATER LEVELS
T KEY WELLS IN SOUTHERN CALIFORNIA

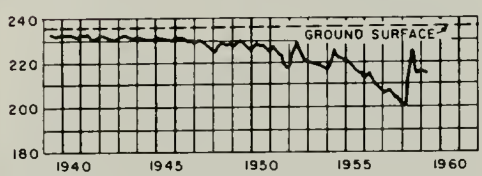
TEMECULA VALLEY (9-5.00)
MURRIETA BASIN (9-5.01)
WELLS 7S 3W-17P4, 17P5, S.B B. & M



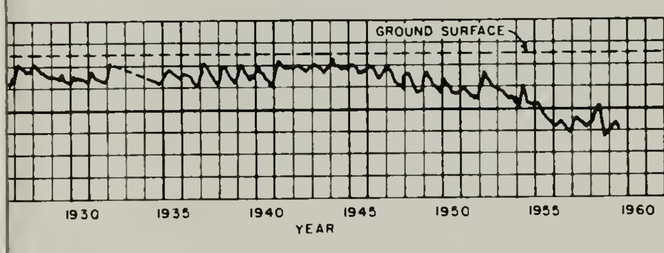
SAN LUIS REY VALLEY (9-7.00)
MISSION BASIN (9-7.01)
WELL 11S/4W-9E1, S B.B. & M.



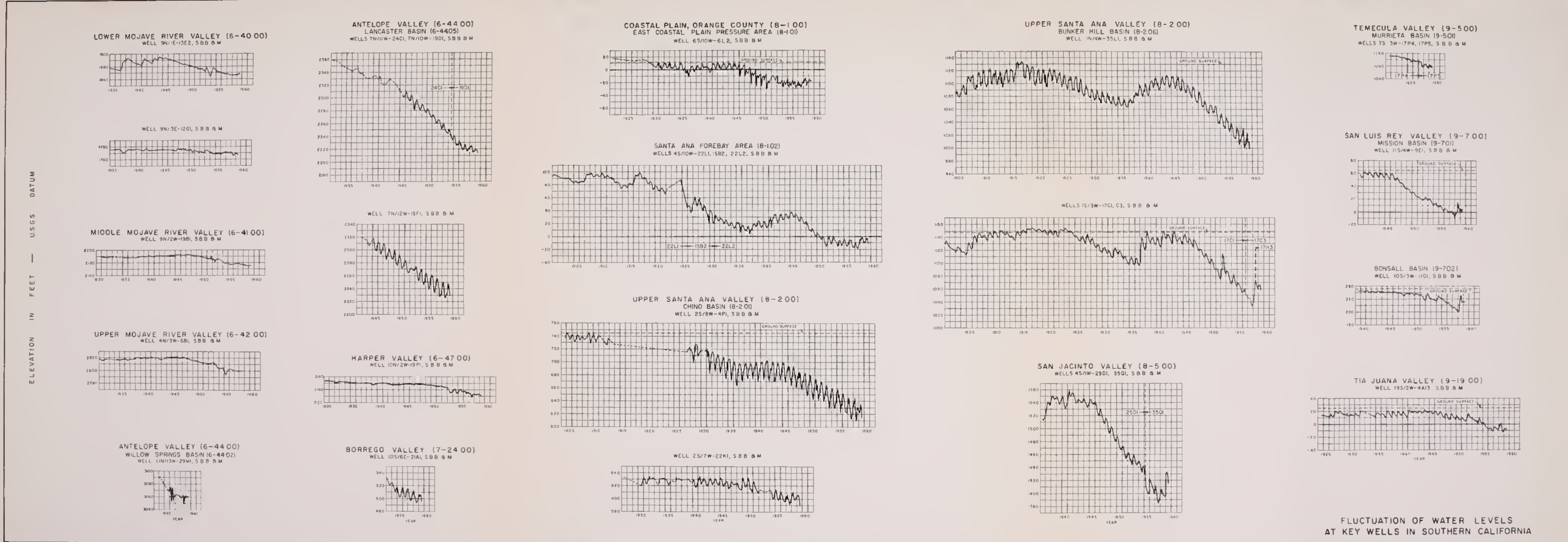
BONSALL BASIN (9-7.02)
WELL 10S/3W-11G1, S.B B. & M.



TIA JUANA VALLEY (9-19.00)
WELL 19S/2W-4A13, S.B.B. & M.



FLUCTUATION OF WATER LEVELS
T KEY WELLS IN SOUTHERN CALIFORNIA



FLUCTUATION OF WATER LEVELS
AT KEY WELLS IN SOUTHERN CALIFORNIA

DEPARTMENT OF WATER RESOURCES SOUTHERN CALIFORNIA DISTRICT 1961

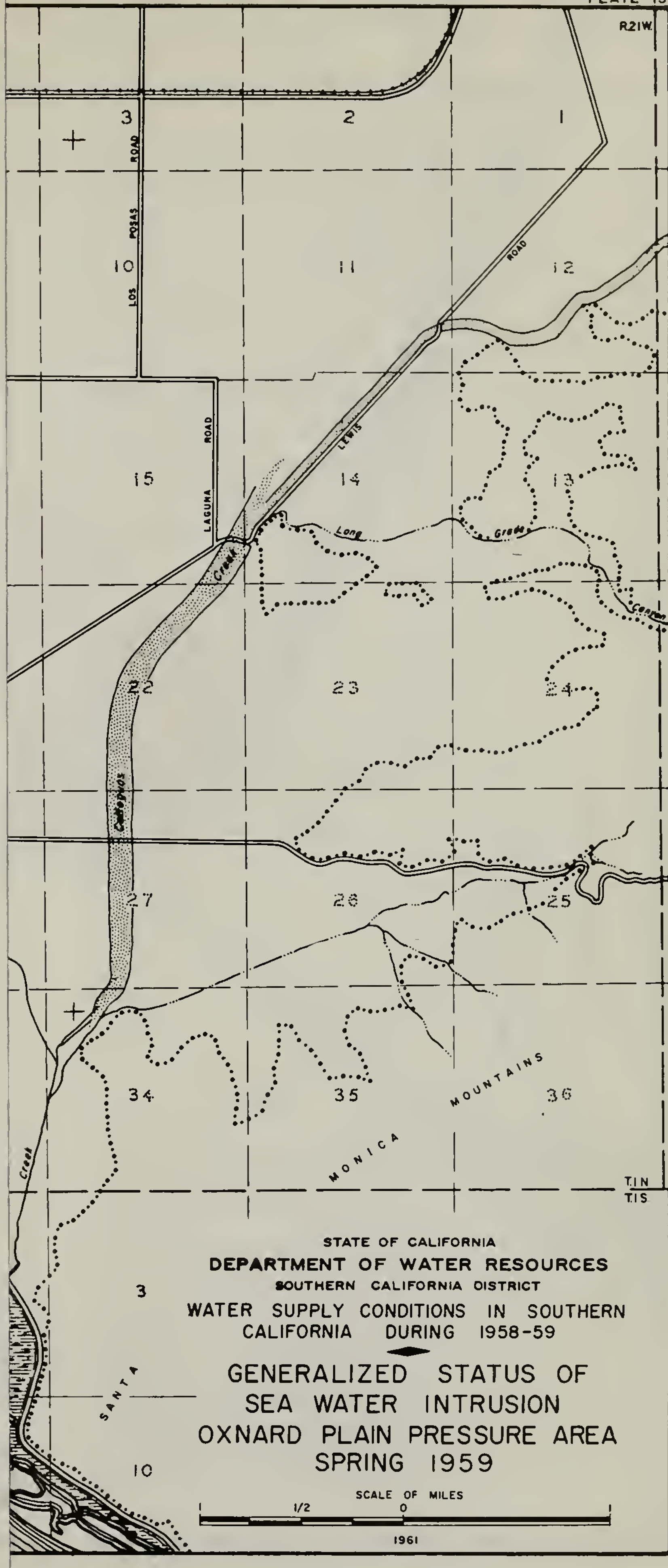
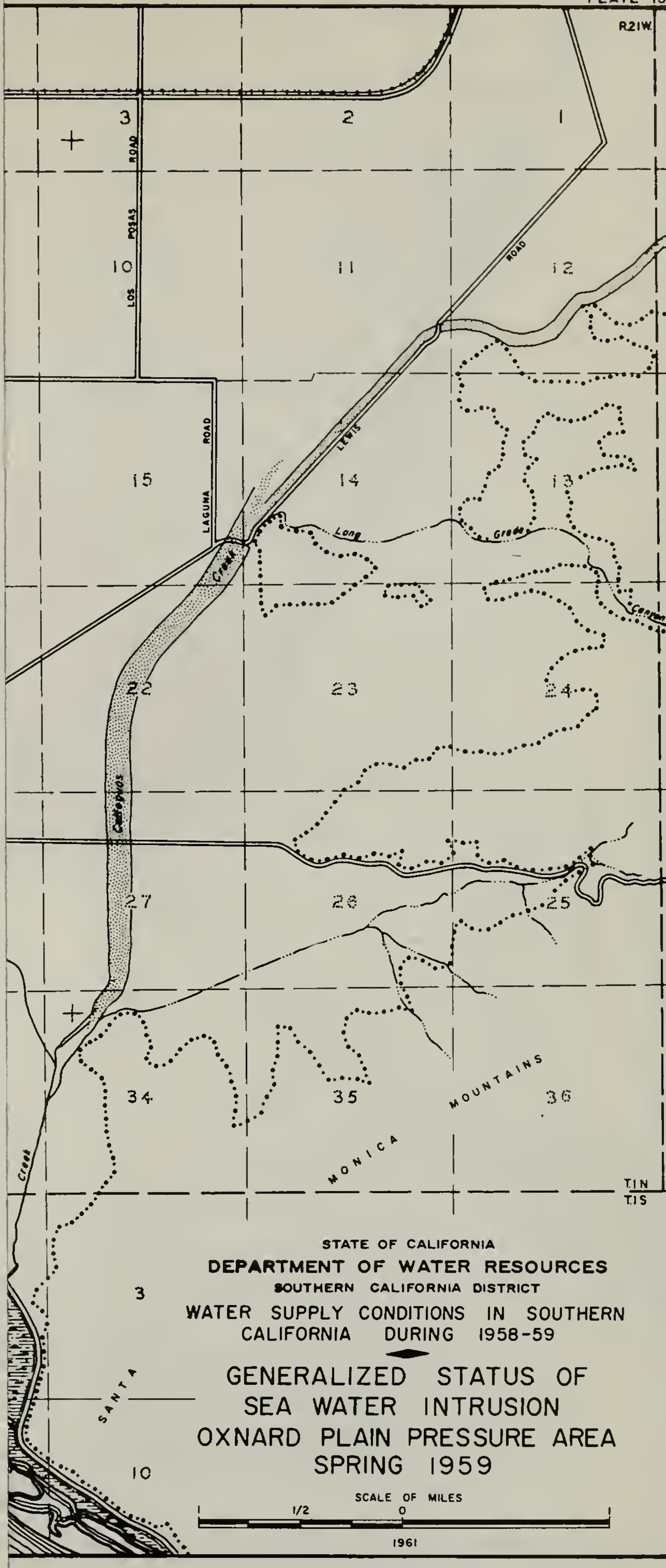

R21W.
3
2
1
LOS POZAS ROAD
10
11
12
LEWIS ROAD
15
LAGUNA ROAD
14
13
Long Grade Canyon
Calleguas Creek
22
23
24
27
26
25
34
35
36
SANTA MONICA MOUNTAINS
T.1N
T.1S
Creek
3
10
STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN CALIFORNIA DISTRICT
WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59
GENERALIZED STATUS OF SEA WATER INTRUSION OXNARD PLAIN PRESSURE AREA SPRING 1959
SCALE OF MILES
1/2
0
1961

PLATE 13



STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN CALIFORNIA DISTRICT

WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59

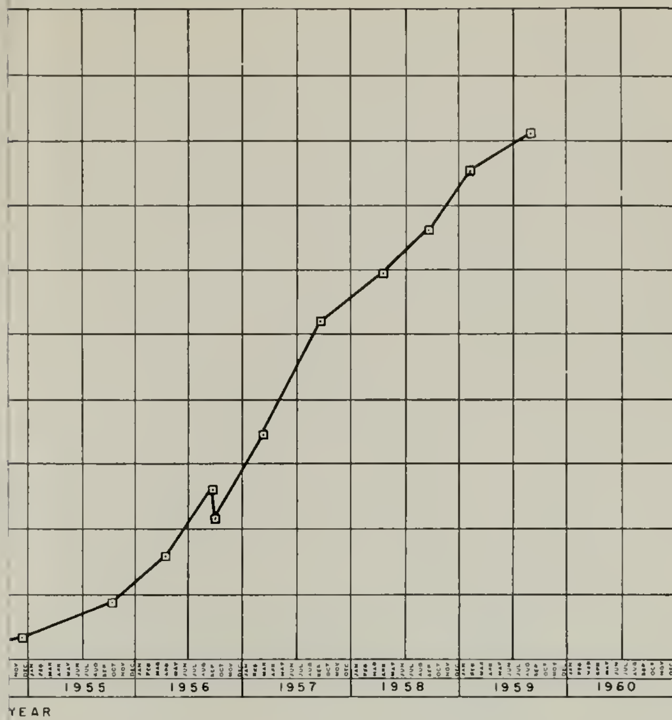
GENERALIZED STATUS OF SEA WATER INTRUSION OXNARD PLAIN PRESSURE AREA SPRING 1959

SCALE OF MILES
1/2 0

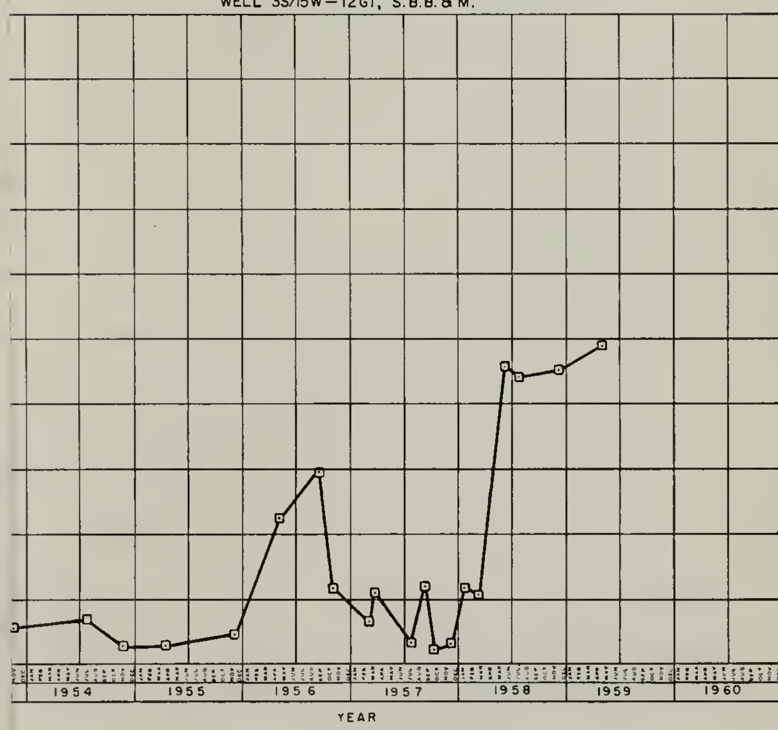
1961


R23W R22W
R22W R21W
R21W
OXNARD
PORT HUENEME
NAVAL RESERVATION
POINT MUGU NAVAL RESERVATION
MUGU LAGOON
PACIFIC OCEAN
SANTA MONICA MOUNTAINS
SOUTHERN PACIFIC RAILROAD
FIFTH STREET
EAST WOOLEY ROAD
LAGUNA ROAD
DEMPSEY ROAD
PLEASANT VALLEY ROAD
HUENEME ROAD
T1N
T1S
LEGEND
CITY BOUNDARY
NAVAL RESERVATION BOUNDARY
EDGE OF NONWATER-BEARING AREA (HILLS)
WELL USED FOR WATER QUALITY CONTROL WITH 1959 DATA
WELL USED FOR WATER QUALITY CONTROL WITH DATA PRIOR TO 1959 ONLY
WELL USED FOR WATER LEVEL CONTROL
WELL USED FOR BOTH WATER QUALITY AND WATER LEVEL CONTROL
-10- LINES OF EQUAL ELEVATION OF GROUND WATER AT WELLS IN THE OXNARD AQUIFER, JUNE 1959
-100- LINE OF EQUAL CHLORIDE ION CONCENTRATION IN WELLS IN THE OXNARD AQUIFER, SPRING 1959
AREA GENERALLY UNDERLAIN BY GROUND WATER CONTAINING OVER 500 PARTS PER MILLION CHLORIDE ION CONCENTRATION IN SPRING 1959
STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN CALIFORNIA DISTRICT
WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1956-59
GENERALIZED STATUS OF SEA WATER INTRUSION OXNARD PLAIN PRESSURE AREA SPRING 1959
SCALE OF MILES
1/2
0
1
1961

:ANGE COUNTY (8-1.00)
PRESSURE AREA (8-1.01)
6L2, S.B.B. & M.

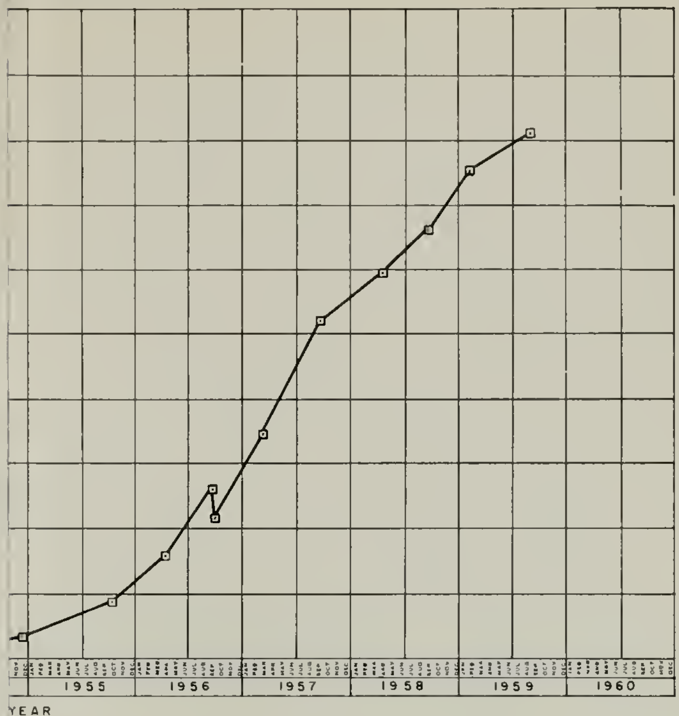


COASTAL PLAIN, LOS ANGELES COUNTY (4-11.00)
WEST COAST BASIN (4-11.02)
WELL 3S/15W-12G1, S.B.B. & M.

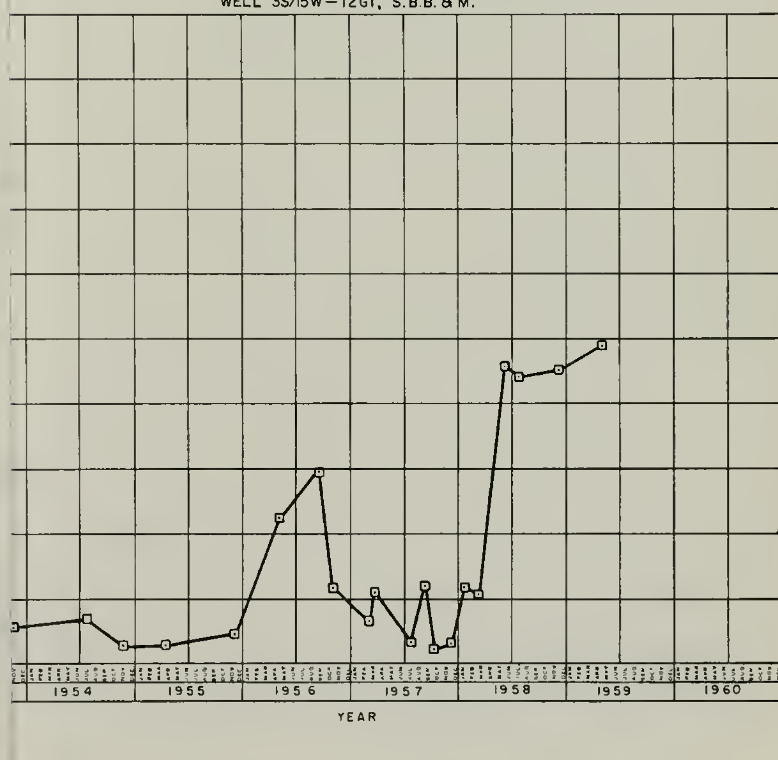


:ONCENTRATION IN SELECTED WELLS

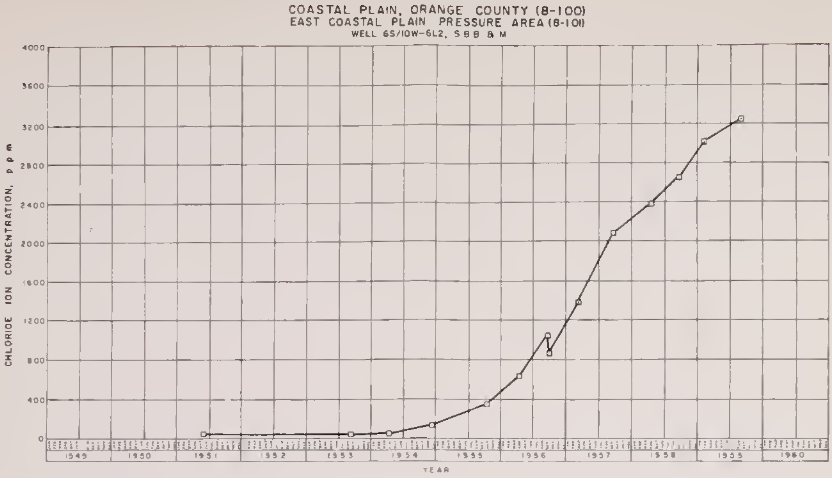
ANGE COUNTY (8-1.00)
PRESSURE AREA (8-1.01)
6L2, S.B.B. & M.

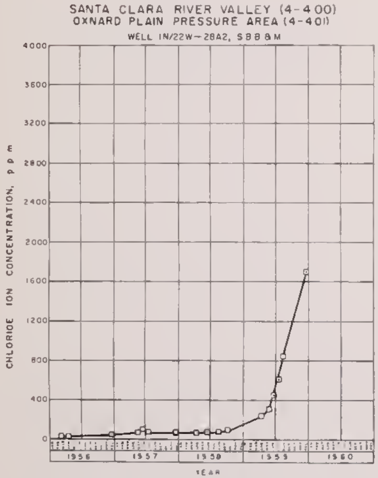


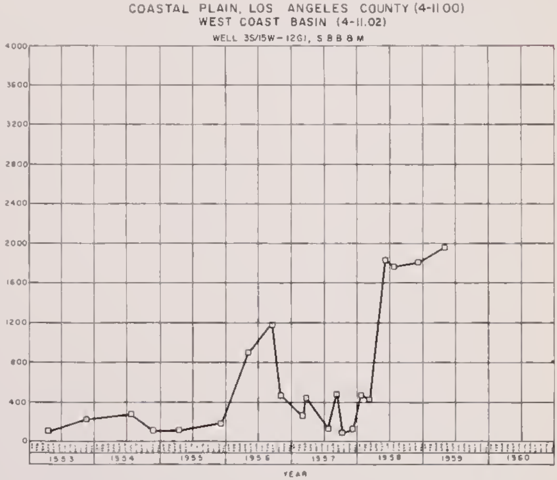
COASTAL PLAIN, LOS ANGELES COUNTY (4-11.00)
WEST COAST BASIN (4-11.02)
WELL 3S/15W-12G1, S.B.B. & M.



ONCENTRATION IN SELECTED WELLS







FLUCTUATIONS OF CHLORIDE ION CONCENTRATION IN SELECTED WELLS

DEPARTMENT OF WATER RESOURCES, SOUTHERN CALIFORNIA DISTRICT 1961

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN CALIFORNIA DISTRICT

WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59

GENERALIZED STATUS OF SEA WATER INTRUSION WEST COAST BASIN SPRING 1959

SCALE OF MILES
1/2 0

1961

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN CALIFORNIA DISTRICT
WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59

GENERALIZED STATUS OF SEA WATER INTRUSION WEST COAST BASIN SPRING 1959

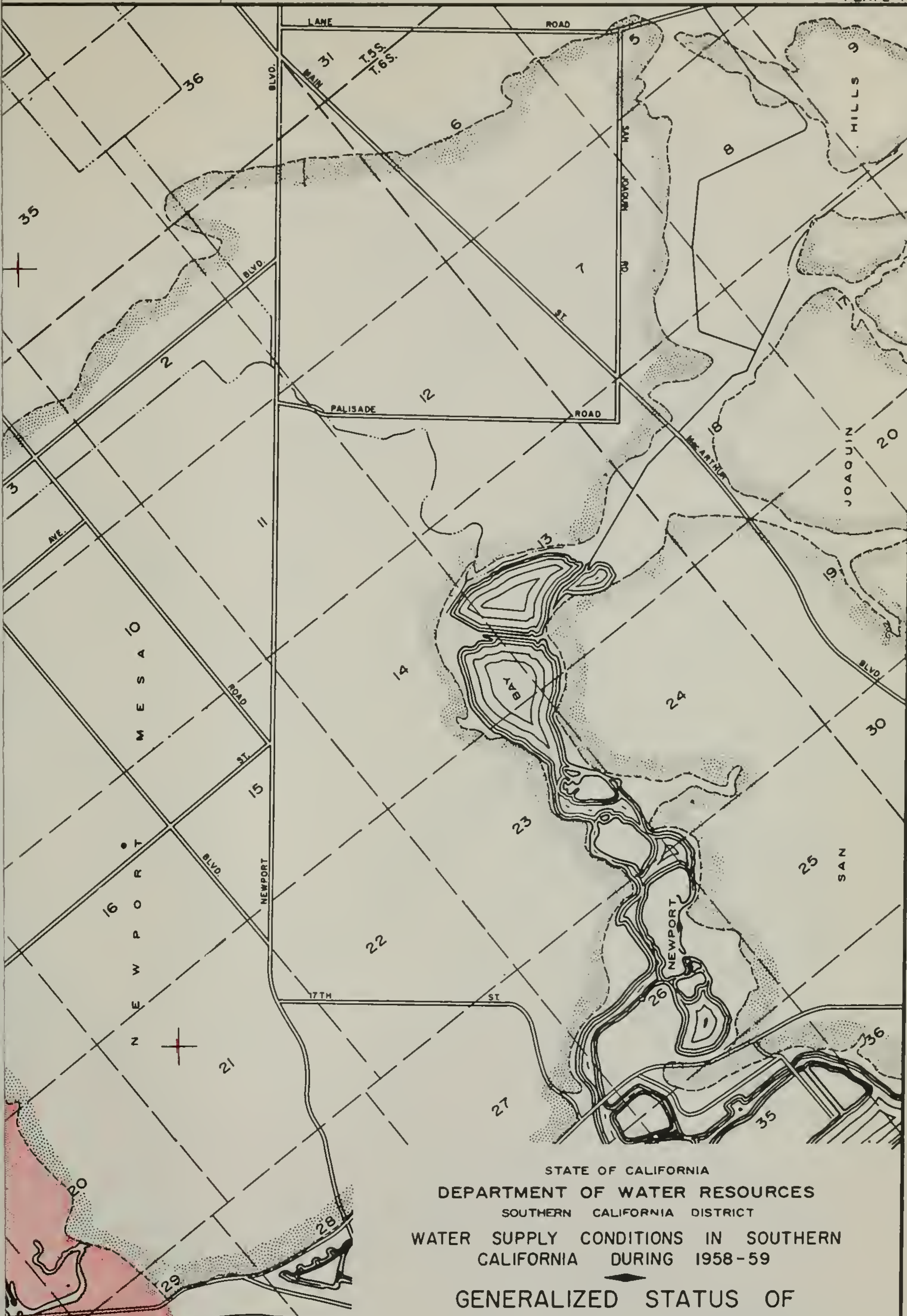
SCALE OF MILES
1/2 0 1

1961


LEGEND
WELL USED FOR WATER QUALITY CONTROL WITH 1959 DATA
WELL USED FOR WATER QUALITY CONTROL WITH DATA PRIOR TO 1959 ONLY
WELL USED FOR WATER LEVEL CONTROL
WELL USED FOR BOTH WATER QUALITY AND WATER LEVEL CONTROL
—10— LINES OF EQUAL ELEVATION OF GROUND WATER AT WELLS IN THE PRINCIPAL AQUIFERS, SPRING 1959
—250— LINE OF EQUAL CHLORIDE ION CONCENTRATION IN WELLS IN THE PRINCIPAL AQUIFERS SPRING 1959
AREA GENERALLY UNDERLAIN BY GROUND WATER CONTAINING OVER 500 PARTS PER MILLION CHLORIDE ION CONCENTRATION IN SPRING 1959
AREA GENERALLY UNDERLAIN BY GROUND WATER CONTAINING OVER 1000 PARTS PER MILLION CHLORIDE ION CONCENTRATION IN SPRING 1959
CULVER CITY
BALLONA GAP
INGLEWOOD
HAWTHORNE
CHARNOCK FAULT
GARDENA
TORRANCE
REDONDO BEACH
HERMOSA BEACH
MANHATTAN BEACH
SEGUNDO
LINE OF INJECTION WELLS
PACIFIC OCEAN
BALDWIN HILLS RES.
LAGUNA DOMINGUEZ
Dominguez Channel
BEARING AREA
EDGE OF WATER
STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN CALIFORNIA DISTRICT
WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59
GENERALIZED STATUS OF SEA WATER INTRUSION WEST COAST BASIN SPRING 1959
SCALE OF MILES
1961

43717

PLATE 16



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DEPARTMENT OF WATER RESOURCES
SOUTHERN CALIFORNIA DISTRICT

WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59

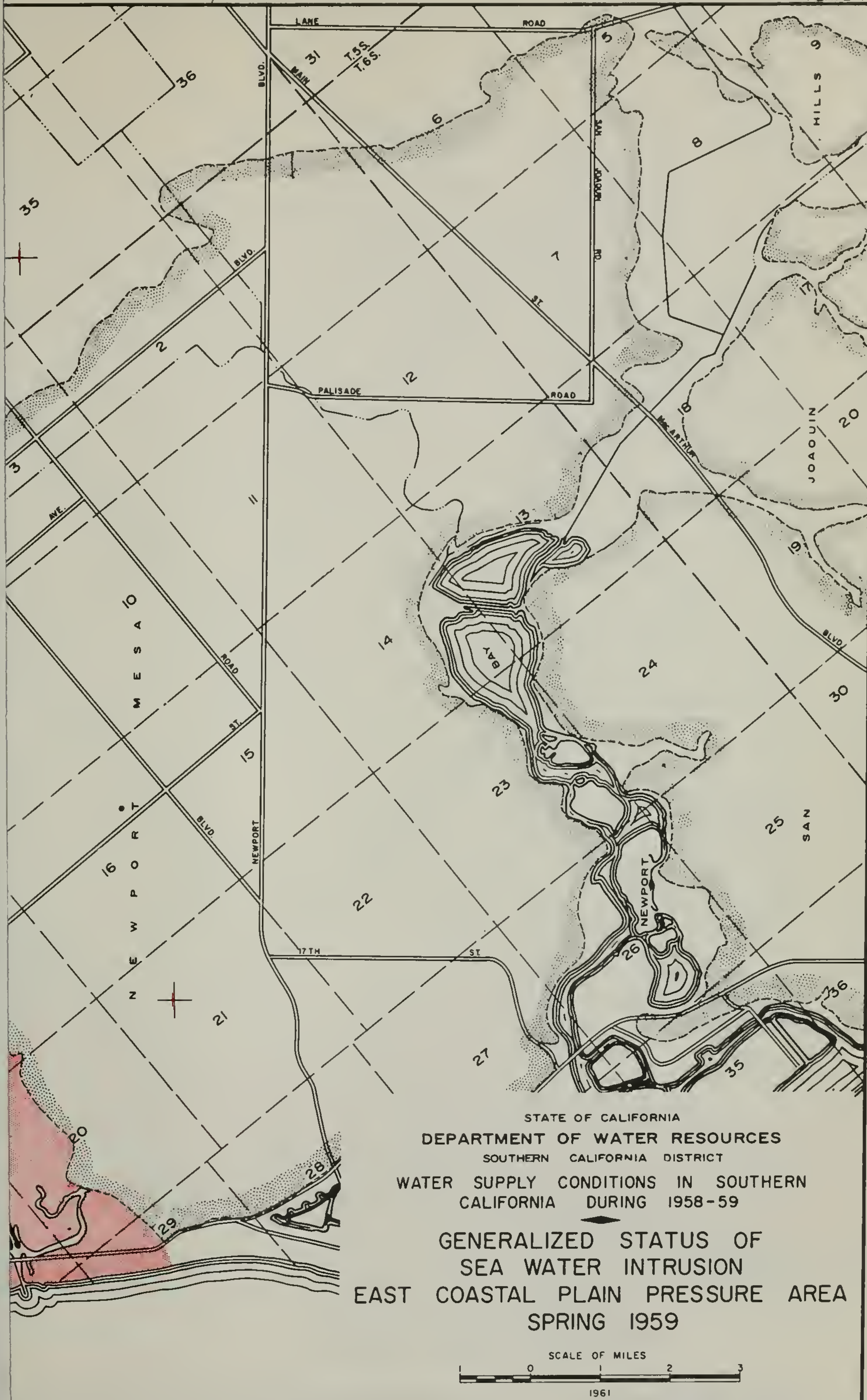
GENERALIZED STATUS OF SEA WATER INTRUSION EAST COASTAL PLAIN PRESSURE AREA SPRING 1959

SCALE OF MILES

1 0 1 2 3

1961

43717



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DEPARTMENT OF WATER RESOURCES

SOUTHERN CALIFORNIA DISTRICT

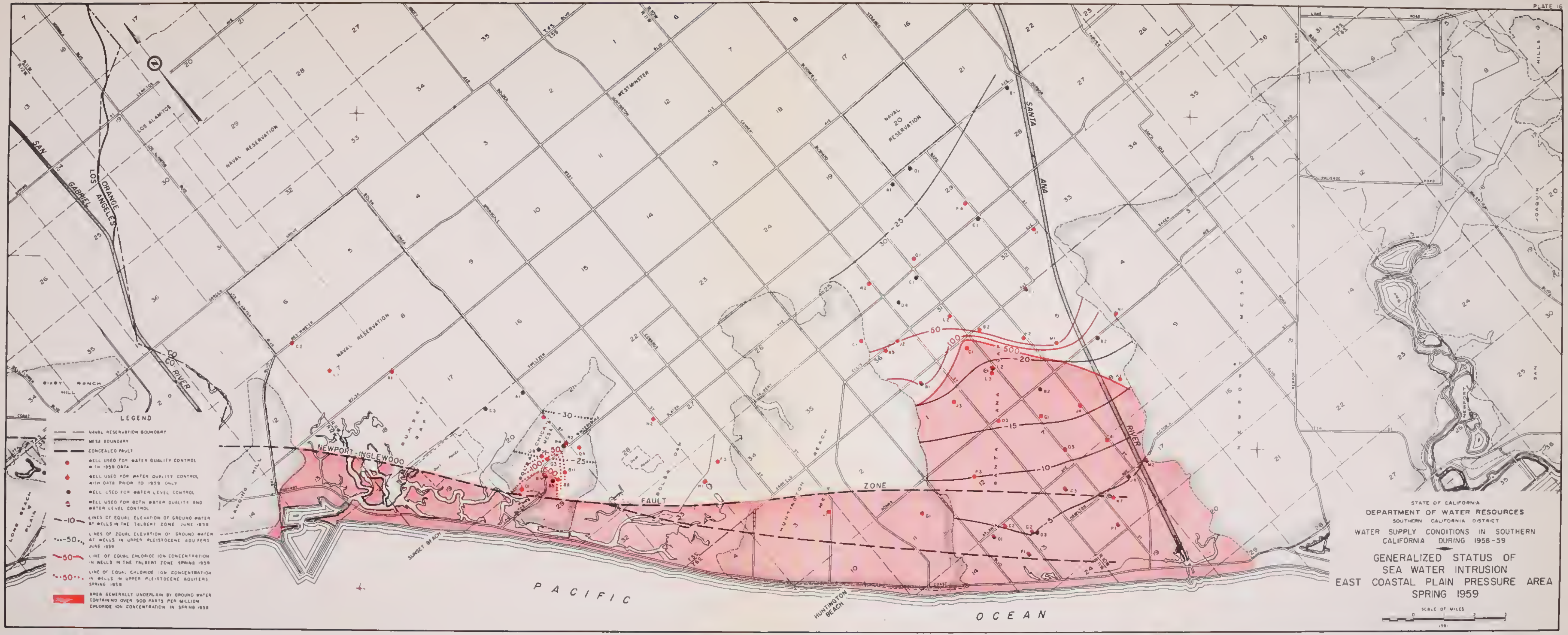
WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59

GENERALIZED STATUS OF SEA WATER INTRUSION EAST COASTAL PLAIN PRESSURE AREA SPRING 1959

SCALE OF MILES

1 0 1 2 3

1961



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SOUTHERN CALIFORNIA DISTRICT

WATER SUPPLY CONDITIONS IN SOUTHERN CALIFORNIA DURING 1958-59

GENERALIZED STATUS OF SEA WATER INTRUSION EAST COASTAL PLAIN PRESSURE AREA SPRING 1959

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